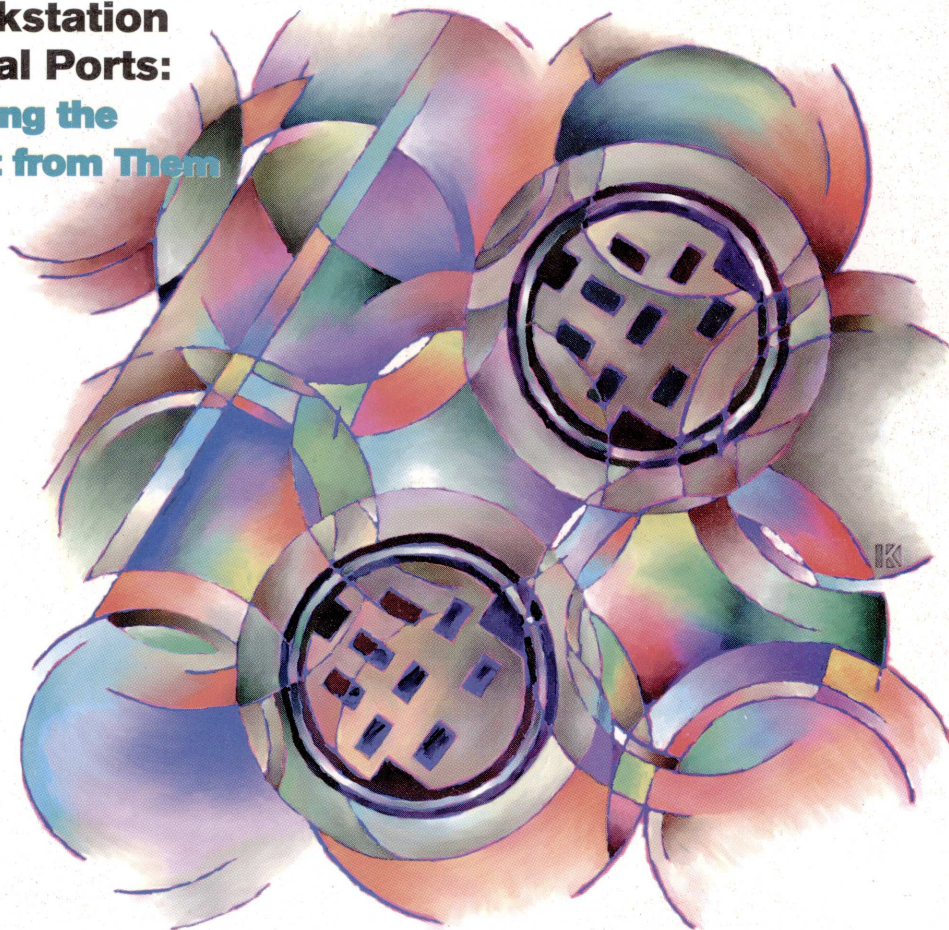


hp-ux/usr

Hands-On Solutions for HP-UX Users • July 1994

**Workstation
Serial Ports:
Getting the
Most from Them**



C Runtime Storage Management on HP-UX • Why did my Backup Fail?
Designing Distributed-Object Technology-Based Applications

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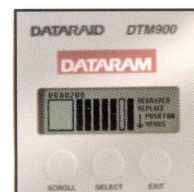
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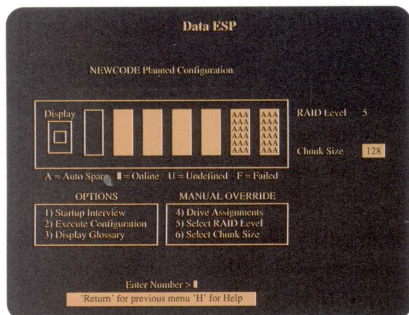


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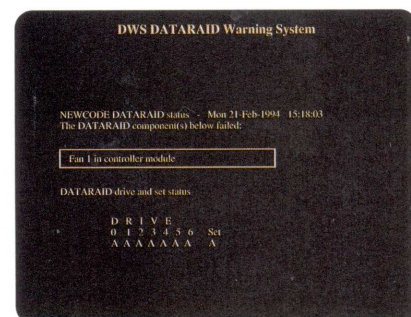
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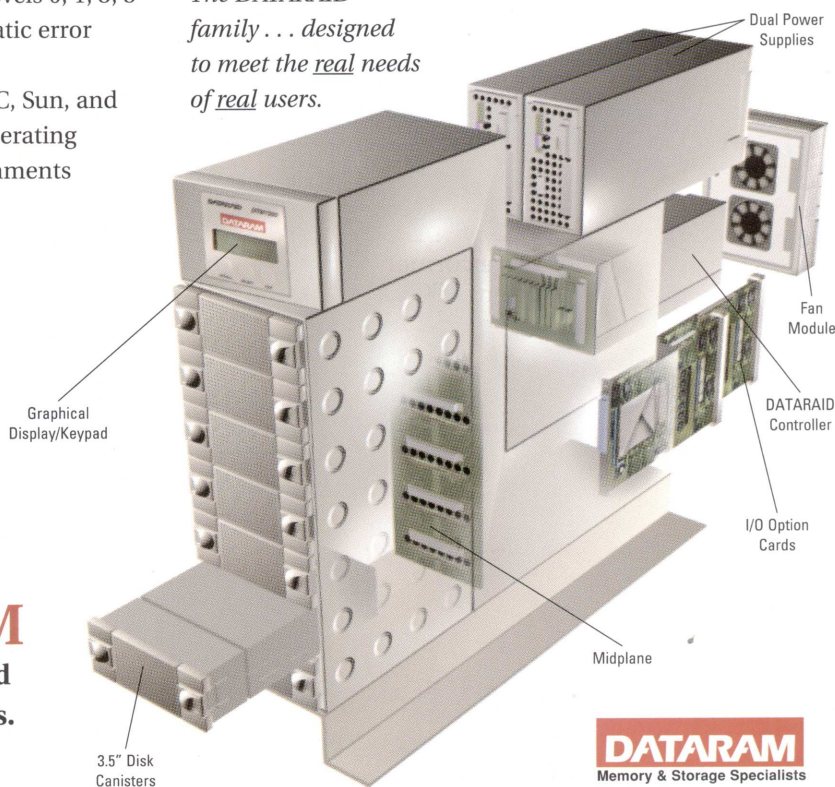
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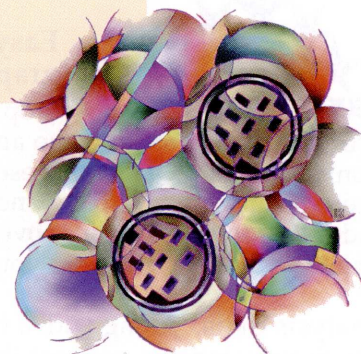
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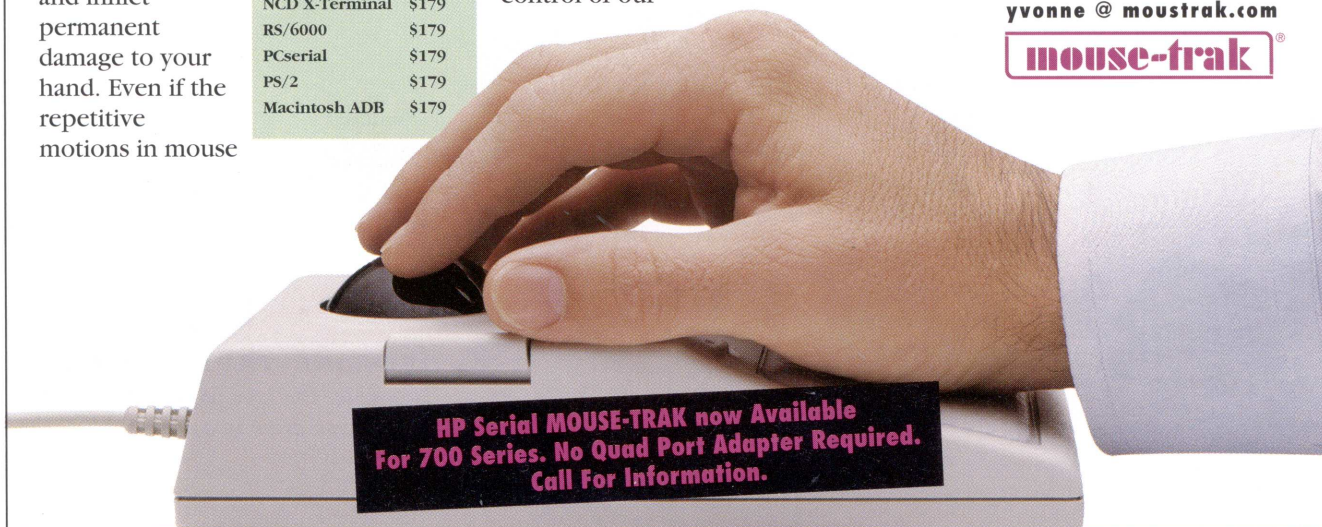
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Question & Answer

Q: I am having communication problems with TCP/IP JetDirect. How can I trace the connection?

A: In tracing connection problems for JetDirect, you may need to trace *hpnpf* activities during execution of the model script. To do this, you can use the logging facility as mentioned in the man page:

`-l logfile`

Write verbose logging information to *logfile*. The logging messages are detailed messages about what *hpnpf* is doing. Included in the messages are the number of bytes read and written to the network connection. If this option is omitted, no logging is performed.

Be sure that the logfile specified uses a full pathname as in:

```
ux2dos /etc/checklist | /usr/lib/hpnpf -x mach_ID -l /tmp/hpnpf.log
```

where *mach_ID* is either the host name for the JetDirect card or an IP address. It is common to have delays in getting host name to IP address conversions done (i.e., a local nameserver), so the IP address will always make the connection. If not, the printer does not have the expected IP address so use the printer's selftest to print the current JetDirect settings.

hpnpf is the primary communication link to the printer and can be used outside the spooler as shown above. The use of *ux2dos* is a way to add CR to the end-of-line char (LF) in plain ASCII files.

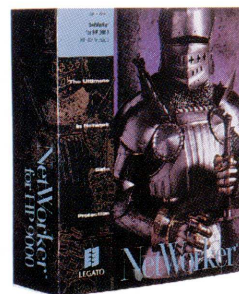
The *hpnpf* trace looks something like:

```
14:26:21 hpnpf[1014] OpenLog: logging started
14:26:21 hpnpf[1014] Process: entered
14:26:21 hpnpf[1014] ResolveAddress: lj3esc.atl.hp.com
14:26:21 hpnpf[1014] OpenSocket: entered
14:26:21 hpnpf[1014] OpenSocket: using 16K send buffer
14:26:21 hpnpf[1014] MakeConnection: 15.17.185.196, port 9100
14:26:21 hpnpf[1014] DoNonBlocking: non-blocking on
14:26:21 hpnpf[1014] Process: sending file -
14:26:21 hpnpf[1014] SendFile: entered
14:26:21 hpnpf[1014] SendFile: 66 bytes read from host
14:26:21 hpnpf[1014] SendFile: 0 bytes read from host
14:26:21 hpnpf[1014] SendFile: 66 bytes written to socket
14:26:21 hpnpf[1014] DoNonBlocking: non-blocking off
14:26:21 hpnpf[1014] Process: read EOF on socket
14:26:21 hpnpf[1014] StopLog: logging stopped
```


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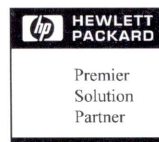
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This is a complete record of the JetDirect connection activity. This same logging can be enabled in the model script to monitor *hpnprf* during *lp* operations. The log file is always appended by *hpnprf*.

Q: I have several systems printing to a JetDirect printer and one of the jobs must be cancelled. How can I determine which system is using the printer?

A: Suppose several host computers have access to a JetDirect printer but one of the systems has started printing a huge job incorrectly. To cancel the job requires knowing which system started the job and *hpnprstat* will provide this information. Use the command:

```
/usr/bin/hpnprstat -a <name_of_prn>
```

where *name_of_printer* is the network printer name. To see a history of connections, you can use

```
/usr/bin/hpnprstat -A
```

which shows the ARP cache held on the card. In all cases, when the printer is connected, you will see the word: ESTABLISHED on the line corresponding to the currently printing job. If no ESTABLISHED line exists, the job may have been completed and internal printer buffers (which may be quite substantial) are just being emptied. In this case, remove the paper tray to stop printing and then perform a hard reset from the front panel (or cycle power to the printer).

Q: Can you list all the limiting values for LVM?

A: Here is a list of the min/max values for LVM structures:

Maximum of 255 logical volumes on a disk.
Maximum of 255 disks in a volume group.
Maximum of 255 volume groups in a system.

Minimum size of a physical extent is 1 Mb.
Maximum size of a physical extent is 256 Mb.

Minimum size of a logical volume is 1 Mb.
Maximum size of a logical volume is 4 Gb.

Maximum size of a file is 2 Gb.
Maximum size of a file system is 4 Gb.

This is a fundamental limitation because the filesystem uses long integer types as pointers. These are 32 bits, giving a maximum offset of 4 Gb when addressing single bytes.

NFS limits include:

Maximum size of a file system is 2 Gb.
Maximum size of a file is 1 Gb.

These limits cannot be changed because the entire structure of the filesystem code, the directory structure, and inode layouts depend on the size of these values. A completely redesigned filesystem is required to increase these values (something that is under active consideration for new HP-UX designs).

Q: I'm getting a SAM error when adding user information. The error is SAM Internal Error: -30008. What's wrong?

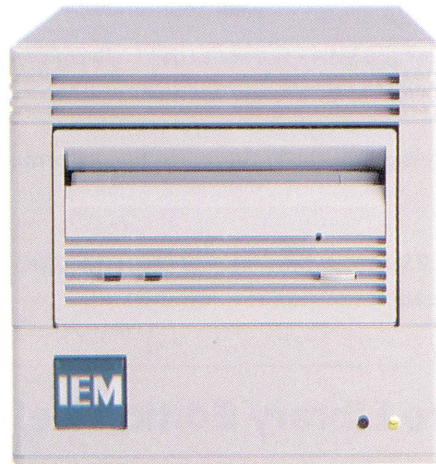
A: The mistake is in using the optional fields for user information in the */etc/passwd* file:

```
Task failed.<username> could not be modified. An invalid gecos
string was passed to "/usr/sam/bin/modusr". This is a SAM
Internal Error: -30008. The value returned from
"/usr/sam/bin/modusr" was 15.
```


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The optional fields called Real Name, Office Location, Office Phone, and Home Phone are referred to as “gecos” information.

The SAM Internal Error -30008 and returned value of 15, occur only when the SAM procedure checking gecoss information returns a value of “BAD.” There are only two cases when this will occur :

1. There is a colon (“:”) in one of the fields.
2. There are more than three commas (“,”) in the string.

If the `/etc/passwd` file is modified manually to include more than three commas, an error will be reported when you use SAM to modify the entry. The following password file entry would be acceptable to SAM as it correctly has four information items and three commas:

```
bill:9ujbfTtM:423:805:Bill,Sydney,8747,2034444:/users/bill:/bin/ksh
      ^---gecos information--^
```

The next entry would cause the error message because there are five information items and four commas:

```
Fred:9hg4dtM:493:234:Fred,Sydney,8747,2034444,sales:/users/fred:/bin/ksh
      ^-----gecos information-----^
```

When you fill in the optional fields, SAM puts commas between the fields as delimiters. The SAM source code checks that there are not more than three commas between the four fields. SAM also won't allow colons in any of the optional fields. SAM will always complain if the fields have these characters and the ‘Help on Context’ explains what is wrong.

Q: I have lost the file `/dev/null`. How do I restore it, and why did it disappear?

A: Occasionally `/dev/null` gets lost or changed in some way, e.g., the permissions have been altered or it is no longer a “character” file. If you need to recreate `/dev/null`, follow these steps as superuser:

```
rm /dev/null
```

New HP-UX Software Library Edition Released by Interex

The 1994 HP-UX Contributed Software Library (CSL) was released on June 1. The new release contains utilities and applications created by experienced users to target the specific challenges facing HP-UX installations. The release contains 48 programs, some of which come directly from Hewlett-Packard Labs. This year's release is one of the most extensive software library collections available today configured specifically for users of HP-UX.

Many exceptional systems administration programs were also contributed. These include:

- ‘top’
- ‘sudo’
- ‘psort’
- current versions of ‘perl’ and ‘imake’
- ‘traceroute’

New utilities include:

- the Free Software Foundation's C compiler ‘gcc’ and libraries
- a movie viewer to display sequenced graphics

All submissions are evaluated by the CSL/HP-UX Quality Assurance Team for technical quality and accuracy, ensuring that the CSL release contains only the highest caliber programs.

An index of the entire HP-UX CSL Library is available from the Member Services Department. Phone 800.INTEREX, fax us at 408.747.0947, or send an e-mail message to csl@interex.org.

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```
mknod /dev/null c 3 0x000002
chown bin /dev/null
chgrp bin /dev/null
chmod 666 /dev/null
```

The most common cause for losing `/dev/null` is running the `c` compiler (as root) and specifying a non-existent source file as in:

```
cc foo.c
```

The compiler removes the output file (which has been initialized to `/dev/null`), without first checking to see that it's still `/dev/null`. When the user doesn't have root capability, `/dev/null` is not removed, only because the user doesn't have enough permission. If root runs the `c` compiler, then `/dev/null` can be accidentally purged.

This has been fixed with the `c` compiler revision A.09.37 for 9.0 systems.

Q: How can I specify file permission defaults for ftp users?

A: There are a couple of ways to do this:

1. The first method involves altering the definitions for the ftp daemon. `ftpd` is the DARPA Internet File Transfer Protocol server. It expects to be run by the Internet daemon `inetd`. `inetd` runs `ftpd` when a service request is received at the port indicated in `/etc/services`.

More detailed information on this can be found in the manual pages for `inetd`, `inetd.conf`, and `services`.

The syntax of `ftpd` is:

```
/etc/ftpd [-l] [-t timeout] [-T maxtimeout] [-u umask]
```

To alter the ftp daemon definition, change the line in `/etc/inetd.conf` from:

```
ftp stream tcp nowait root /etc/ftpd ftpd -l
```

to:

```
ftp stream tcp nowait root /etc/ftpd ftpd -l -u002
```

Files created by `ftpd` will have permissions of `rw-rw-rw-` unless there is a `umask` to alter the permissions. By default the `umask` is 027, which gives default permissions for files created by ftp as `rw-r-----`.

So, the example above would cause files created by an ftp user to have access rights of `-rw-rw-r--`. For more details on masking, refer to the manual pages for `umask`.

Once the `/etc/inetd.conf` file has been altered, it is necessary to force `inetd` to reread its configuration file. This can be done by entering:

```
inetd -k (kills the current process)
/etc/inetd -c (restarts the inetd process)
```

2. From within `ftp`, you can use the command `umask` from the `ftp` prompt:

```
ftp hphost
Connected to hpsystem.kkk.lll.com.
220 hphost FTP server
Name (hphost:root):
331 Password required for root.
Password:
230 User root logged in.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> umask 002
200 UMASK set to 002 (was 027)
```

The second solution requires the user to remember the `umask` command.

General HP-UX and 9000 questions are answered by Bill Hassell, a support engineer at the HP Response Center in Atlanta, Georgia. He can be contacted by e-mail at blh@hpuaerca.atl.hp.com.

HP 9000 Workstations

Q: I have an HP 9000 Series 382 CPU running HP-UX 9.0, BASIC/UX 6.3, and VUE 3.0. I am having problems when initializing floppies in the built-in 3.5 SCSI floppy drive on the 382. When I start BASIC/UX from an hpterm window as the superuser, I can catalogue and initialize my floppies with no problem. However, when I start RMBUX from the icon on the top row of the VUE control panel, I can catalogue LIF floppies, but when I try to initialize them I get an error 66 INITIALIZE failed. I followed the instructions in */etc/newconfig/rmb/README.FIRST* for setting up the front panel control, so why am I seeing this behavior?

A: This is because of the EXEC-STRING in the *START_RMB.vf* and *RUN_RMB.vf* files located in */etc/newconfig/rmb* that you copied to your *\$HOME/.vue/types* directory. The EXEC-STRING (*/bin/sh -c '/usr/bin/rmb -X' &*) sets up a clash with VUE as to the parent of the basic session, which causes command string problems. To correct this problem edit the *RUN_RMB.vf* and *START_RMB.vf* files' EXEC-STRINGs as follows:

```
ACTION START_RMB
L-ICON /usr/lib/X11/bitmaps/Rmb.l.bm
S-ICON /usr/lib/X11/bitmaps/Rmb.s.bm
DESCRIPTION Runs the BASIC/UX interpreter.
TYPE COMMAND
EXEC-STRING /usr/bin/rmb -X
WINDOW-TYPE NO-STDIO
END

ACTION RUN_RMB
L-ICON /usr/lib/X11/bitmaps/Rmb.l.bm
S-ICON /usr/lib/X11/bitmaps/Rmb.s.bm
DESCRIPTION Starts execution of a BASIC/UX \
    program.
TYPE COMMAND
EXEC-STRING /usr/bin/rmb -X %(File)Arg_1 \
    "Name of a STOREd program: %"
WINDOW-TYPE NO-STDIO
END
```

Q: How do you set the intensity of the PENs in BASIC/UX 6.3 running in windows? I have tried the SET PEN command but it does not seem to affect the intensity.

A: Try executing the following command:

```
PLOTTER IS CRT,"INTERNAL";COLORMAP
```

Executing the PLOTTER IS statement without the colormap option causes the colormap to be define as follows:

```
0 = zero intensity
1 = full intensity
```

which is the emulation of the HP 98627A non-colormapped device on a color bit-mapped display.

Q: I just installed BASIC/UX 6.3, but when I try to run the rmb I get an error:

```
binary 66 wrong version aborted
```

What could be causing this error? I checked the *update.log* in the */tmp* directory and the product updated without error. I then did a *what* on */usr/bin/rmb* and this returned 6.3 as the version.

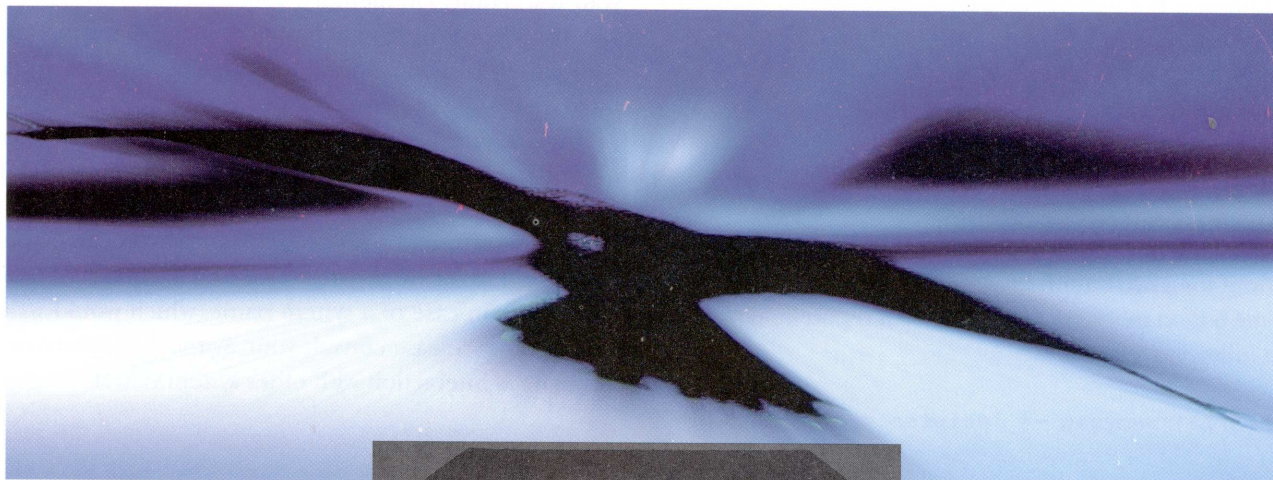
A: This has been a common error after update to RMBUX 6.3 because rmb was aliased at BASIC/UX 6.2 by the system administrator for ease of use. To check this do the following:

```
(ksh) alias -t
(csh) alias
```

this should show rmb has been aliased to "rmb -L SCSI". At BASIC/UX 6.2 the SCSI binary was not included as part of the released product. Later HP released a patch that consisted of the SCSI binary. To use the SCSI binary on a BASIC/UX 6.2 system the user had to execute the rmb command with a -L SCSI to load the binary, so many of the administrators aliased the command string.

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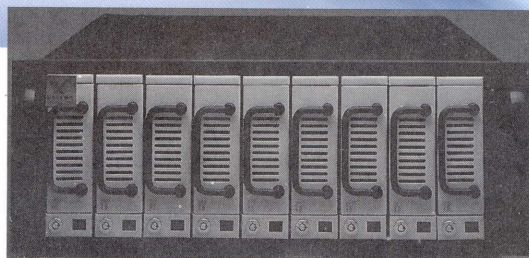
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Q: I am running BASIC/UX 6.3 over HP-UX 9.0 on an HP 9000 Series 382. I want to use my mouse buttons to control some code I am developing, but I find that the buttons are defined as follows:

```
left button = 1
middle button = 3
right button = 2
```

I would like to change the definitions so that:

```
left button = 1
middle button = 2
right button = 3
```

Can this be done and, if so, how?

A: Yes, the button definitions 1 3 2 are the default set by OSF/Motif for a two-button mouse. To change the definitions for a three-button mouse so that the buttons report in sequence, use the following command:

```
/usr/bin/X11/xmodmap -e "pointer = 1 3 2 4 5"
```

Q: How can the title for a BASIC/UX window be changed from the default "HP BASIC/UX:600"?

A: To change the default title of the basic window, use the `-title` option to `rmb` as follows:

```
rmb -title "MY TITLE"
```

This will change the title to "MY TITLE:600". The window number of 600 will always be displayed.

Q: I am running Visual Engineering Environment(VeeTest) over HP-UX 9.0 on a 9000 Series 382 with 32 meg of RAM. I am developing a test to characterize notch filters with VeeTest and while editing my test, as I tried to clone one of my larger user

objects, I received an error dialogue saying that the process was out of memory. I want to know why this is happening; my test when saved is only 3.5 meg in size and I have 32 meg of RAM. Also, how can I correct this behavior?

A: The reason you received the error dialogue is that the running process exceeded the maximum data size as set in the kernel. The file you saved to disk from VeeTest is a description of your test model. The executing VeeTest process uses this description to tell it how to build the different structures your test requires in memory. Your executing process can be, and usually will be, much larger than the descriptor file. In your case, when you cloned the large user object, it pushed the data size over the maximum limit.

To correct this condition you will need to increase maximum data size defined by the `maxdsiz` variable in the HP-UX kernel. `Maxdsiz` is set to 16 meg by default on the Series 300 machines and may be set as high as 4 Gbytes. You should be careful not to set `maxdsiz` to a value that is larger than your allocated swap in case of a system panic, which would write the core to swap. Please consult your *System Administration Tasks* manual for interaction with other system values. ■

Rudy Stanley, an applications support engineer with the HP Response Center in Atlanta, Georgia, answers HP 9000 Workstation questions.

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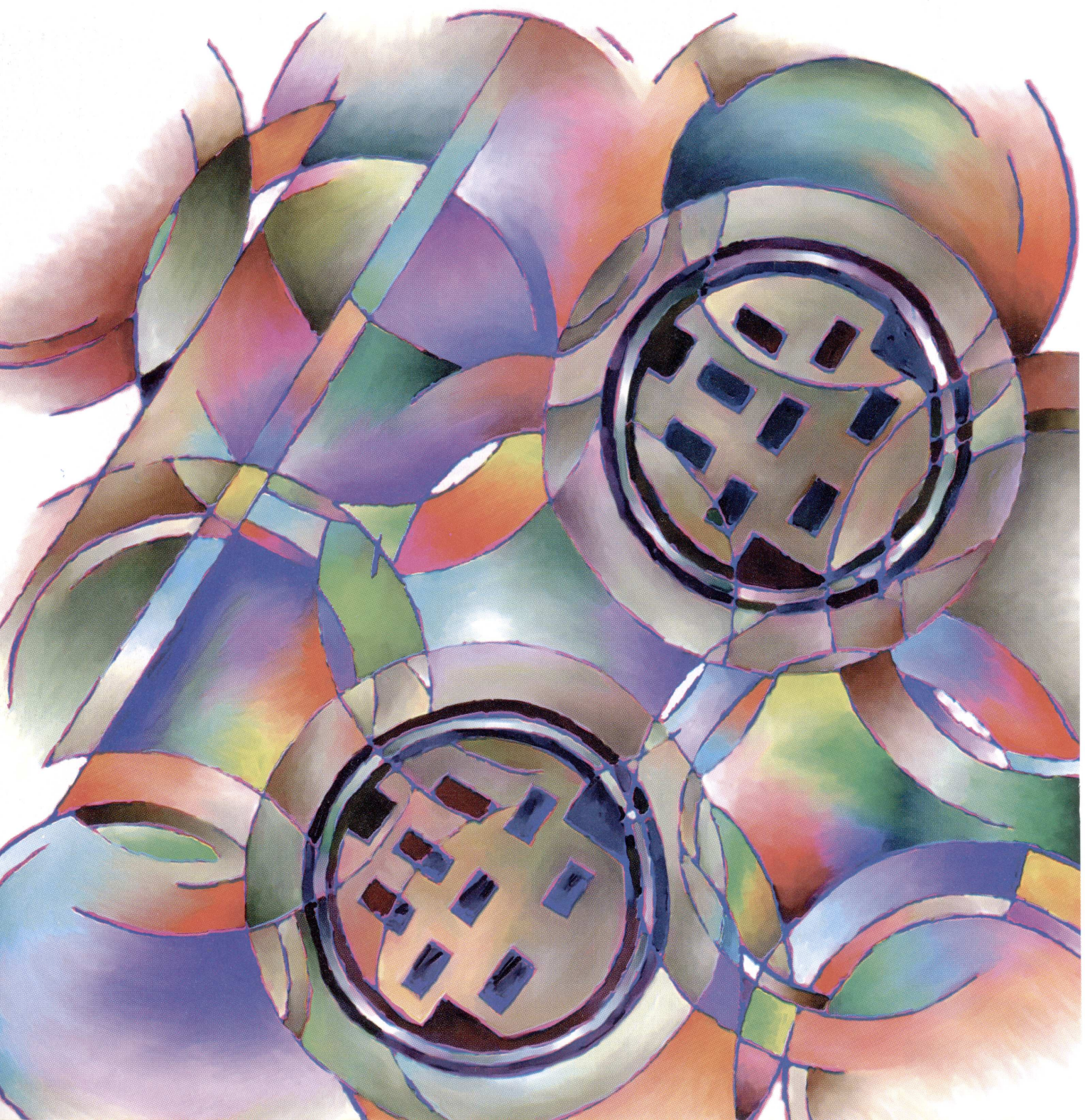
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CIRCLE 149 ON READER SERVICE CARD



Workstation Serial Ports:

Getting the Most From Them

The 700 series workstations come standard with two serial data communications ports (except for 715s, which have one). They can be used for many purposes, including

- connecting ASCII terminals
- connecting printers and plotters
- connecting an Uninterruptible Power Supply (UPS)
- making a window a terminal emulator
- connecting modems for remote logins or data communications programs
- communicating to miscellaneous RS-232 Serial devices

This article will discuss the use of the ports and some considerations applicable to each of the aforementioned alternatives.

Port Capability, Limitations, and Features

The two serial ports are RS-232 9-pin connections that have pinouts like those of most personal computers. The pins have the following signals:

Carrier Detect	CD	1
Receive Data	RD	2
Transmit Data	TD	3
Data Terminal Ready	DTR	4
Ground	GND	5
Data Set Ready	DSR	6
Request to Send	RTS	7
Clear to Send	CTS	8
Ring Indicator	RI	9

Both ports have full hardware (RTS/CTS) flow control and can support data rates up to 460,000 baud. However, there are some considerations on this number:

1. Baud rates above 19,200 baud require both hardware and software flow control.
2. Since only RS-232 is supported, data rates above 19,200 baud may require some special low-capacitance, shielded cable to prevent data distortion. This problem is not unique to the HP workstations but is applicable to any serial RS-232 device running at high speeds.

As of the 9.X revisions of HP-UX, no system programs discussed in this article will work with baud rates above 38.4K. This is expected to change at the 10.0 revision of HP-UX, but until that time, any communication above 38.4K will be through a user-written program.

Serial ports are unusual in one important respect. When a process has a serial port open, it can change its parameters, but once the last process closes the port, all parameters return to their default. This is handled automatically by the HP communications programs, *getty*, and the spooler, but is an issue (as addressed below) for other uses.

The manual pages for *termio(7)*, *termiox(7)*, and *stty(1)* contain much useful information on serial ports.

Connecting ASCII Terminals

Standard ASCII terminals such as HP's Series 700 terminals or third-party CRTs such as DEC and Wyse can be connected to these ports. The cable used should be one defined for use as

DTE (Data Terminal Equipment) to DTE, such as a modem eliminator cable. For HP terminals, the HP24542G or its equivalent would be used. Other terminals may require different cables, but the 24542G should be correct for all terminals.

The 24542G cable has the following pinouts:

CPU (DB-9 F DTE)			MODEM (DB-25 M DCE)	
CD	1	←	4	RTS
RD	2	←	2	TD
TD	3	→	3	RD
DTR	4	→	5	CTS
		→	6	DSR
GND	5	↔	7	GND
DSR	6	←	20	DTR
CTS	8	←		
RTS		→	8	CD

To connect a terminal, the user must create a device file for each port to be used. By convention, terminal ports are called `tty00` and `tty01` for ports 1 and 2, respectively. The Systems Administration Manager (SAM) can be used or the administrator can create the files with the `mknod(1M)` command. For port 1, the minor number (driver parameter values) would specify address 4 and port 2 would use address 5. The major number (driver number) for both would be 1. Therefore to set up the ports, type:

```
mknod /dev/tty00 c 1 0x204004
mknod /dev/tty01 c 1 0x205004
```

The last digit, 4, indicates the port is for a direct connect (hardwired) device rather than one using modem control signals.

The next step in setting up a port is to create a `getty(1M)` entry in the `/etc/inittab` file. This, again, can be done with SAM or manually. A `getty` entry for the serial ports would be of the form:

```
tty1:234:respawn:/etc/getty -h tty00 H
tty2:234:respawn:/etc/getty -h tty01 H
```

The 234 represents the system init states 2, 3, and 4 during which the ports would be active. State 2 is the normal multi-user (non-Windows) state and states 3 and 4 are used by VUE. Note that when the 9.X revision of SAM sets up a serial entry, it puts only the 2 in the `inittab` file and you may

have to add the 34 manually with an editor to activate the ports in those states.

The “H” represents the `gettydefs` entry that provides port setup. This entry runs the port at 9600 baud, 8 bits, no parity and one stop bit, which is normal for direct-connect terminals. The use of the “9600” entry should be avoided as it is designed for modems running 7 bits, even parity, and contains provisions to switch modem baud rates. For rates above 9600, there is a modem 7/even entry for 19200, but I would suggest manually creating an entry similar to the “H” entry for 19200 and using that. There are no 38.4K entries, so one would have to be created manually. Be careful about modifying this file as errors will cause the entry or parts of the entry to be silently ignored.

For a full explanation of the `getty`, `login`, `gettydefs`, `inittab` interaction, see the article “Understanding `getty` and `login`” in the March 1993 issue of *hp-ux/usr*.

There is a licensing issue here that must be understood. Most Series 700 workstations are provided with a two-user license. One license is for all users coming in across the network and one is for the console. Therefore, while it is possible to have a `getty` for the console while simultaneously having `gettys` for both serial ports, only one of the three may be active and a user will be denied access if one of these three devices is already in use. A multi-user license is available from HP.

Printers and Plotters

Unlike terminals, serial printers and plotters require no licensing. For spooling with the `lp(1)` spooler, SAM or the `lpadmin(1M)` command can be used to set up the printer. By default, the HP-provided `lp` model scripts run devices at 9600 baud using XON/XOFF protocol. Changing the speed requires editing the `stty(1)` commands in the model scripts to specify the desired speed. SAM will create its own names for the device files when it sets up printers, or you can create them yourself if you use `lpadmin`. In either case, they should be hardwired devices with the same minor number as terminals described above.

For “dumb” (non-HP devices not emulating HP devices), you will need to edit the dumb model script in `/usr/spool/lp/model` to uncomment the serial configuration commands. The script documents the required changes.

Adding hardware flow control for a printer or plotter requires one of two methods:

1. Modify the model script `stty` commands to add `ctxxon` on every line.

or

2. Add 8 to the minor number, e.g., 0x204004 plus 8 equals 0x20400C (remember it is hexadecimal).

Either way will cause the port not to send data unless the RTS line is raised by the printer or plotter. For a fuller discussion of RTS/CTS and XON/XOFF flow control and more detailed setup information, see the November 1993 issue of *hp-ux/usr*.

Printers and plotters should use the same cable (24542G) as terminals.

If the spooler is to be bypassed so that the printer is connected as a "hot" device allowing the user to redirect output to the file, then the port must be set up and held open while in use. Generally, the administrator should set up the port in the */etc/rc* file as follows:

```
nohup sleep 1000000 </dev/tty00 &
```

which puts a *sleep(1)* of some huge number of seconds on the port to keep it open indefinitely while inhibiting termination signals. This allows the *stty* command to set parameters that will remain as long as the sleep exists. The *stty* command would probably look something like this:

```
stty 19200 sane </dev/tty00
```

Once the port is held open, it can be used by simply redirecting output to it. Note, however, that two users redirecting output would have their data intermixed because the spooler, which would prevent this from happening, is being bypassed.

Common problems with printers and plotters include

- improper baud rate and flow control setup
- cables that are too long, which result in loss of XON/XOFF flow control characters
- misunderstanding of the inability of XON/XOFF to detect a printer that is turned off

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Note that there should *not* be a *getty* running on a port used for printers or plotters.

UPS

UPS systems provide the ability to keep power going during power failures and brownouts and allow the orderly shutdown of a workstation and its peripherals when these occur. Connecting a UPS is fairly simple. The port must be a hard-wired port and must be held open using the method described for hot printers. Do not use a *getty* on the port. Specific setup and software issues should be addressed to the UPS supplier.

Terminal Emulation

HP-UX provides two programs, *kermi*(1) and *cu*(1), that make your terminal or hterm/xterm window appear to be connected as an ASCII terminal connected locally or via modem to a remote system.

Kermi is an industry-standard program that provides both interactive use as well as bi-directional online file transfer capability for both ASCII and binary files. HP provides *C-Kermi* from Columbia University. *Kermi* commands and use are described in the *kermi* manual pages and the *Remote Access User's Guide*. There are also many excellent *kermi* books available from bookstores and additional documentation

and technical support is available from Columbia. When running *kermit*, the device file, speed, and parity are specified and *kermit* will handle the communications.

The *cu* program is part of the UUCP subsystem and is designed primarily to support calling other UNIX systems. However, it can be used as a general interactive terminal emulator. Its file transfer capabilities are limited and the appropriate commands assume a UNIX machine at the other end. To set up *cu* requires defining its device files and callout speeds in the */usr/lib/uucp/Devices* file.

Many have asked what type of terminal *kermit* and *cu* emulate. The answer is that they emulate no terminal. Both programs transparently pass data from your window or terminal to and from the serial port. Therefore, if I were using an xterm or VT100 terminal, I would tell the remote I was a vt100. If I were using an hpterm or HP terminal, I would tell the remote end that I was an HP.

Modems

Connecting modems to an HP-UX workstation should be a simple matter. However, because so few people understand their systems, it is sometimes needlessly complicated. The HP Response Center can provide step-by-step modem setup instructions but I will summarize them here.

Modems come from the factory set up for PCs. Therefore, nearly all modems must have factory defaults changed. This is true for virtually any UNIX system as a multi-user system has to know when the modem is available or in use by a user and has to be able to log off a user calling in on the modem in case of an abnormal hangup or failure to log off.

The proper cable must be used. For Series 700 workstations, this is the 24542M 9 to 25 pin cable. Most PCs will use the same pinouts and a PC to modem cable *should* work.

The 24542M cable has the following pinouts:

CPU			MODEM		
(DB-9 F DTE)			(DB-25 M DCE)		
CD	1	←	8	CD	
RD	2	←	3	RD	
TD	3	→	2	TD	
DTR	4	→	20	DTR	
GND	5	↔	7	GND	
DSR	6	—	6	DSR	
RTS	7	—	4	RTS	
CTS	8	—	5	CTS	
RI	9	←	22	RI	

The proper device files must be used. HP-UX has the ability to use multiple device files on a port to provide the appropriate modem control signals. This is unique to HP-UX and provides some nice benefits. However, it also means that the improper use of a device will result in the failure to make it work. For all callout programs such as *kermit* and *cu*, the callout device must be used with modems to raise the modem control lines and communicate to the modem before connection and to the other end after connection. For *getty*, the callin device file must be used to disable its port access until there is a connection. The manual page *modem(7)* has a discussion of the *callin*, *callout*, and hardwired device files.

The traditional UNIX *getty* program for modems *uugetty(1M)* is NOT required for HP-UX but may be used if desired.

I caution the reader about the use of CCITT mode for modem control and status. CCITT mode is available on HP-UX workstation ports. HP-UX supports CCITT mode only with CCITT modems provided by some European governments. Many modems claim CCITT compatibility but may not work properly in CCITT mode. This mode is not the common reference seen in modem advertisements that advertise CCITT V.42 or other compliance that generally refers to modem-to-modem standards. CCITT mode is not necessary. Modems will generally work fine with the use of the U.S. modem protocol, which involves the use of a single control and a single status line.

Advanced but now common modem features such as MNP, LAP-M protocols and modem flow control can cause a modem not to communicate properly. Unlike PC programs that provide automatic modem setup based on a menu of modem choices, UNIX relies on the user to determine which modem parameters must be set and what means will be used to set them. There is an article in the January 1994 issue of *hp-ux/usr* that covers many modem setup issues.

Data Communications Programs

There are many data communications programs and subsystems. I will restrict my discussion to the two principal ones provided with HP-UX for use with serial ports. They are Unix-to-Unix Copy (*UUCP*) and Serial Line Internet Protocol (*SLIP*).

UUCP

The *UUCP* subsystem is traditional with UNIX and is considered the poor man's networking as it provided networking capabilities over inexpensive dialup modems long before local

area networks and software existed. *UUCP* provides file copy between systems, inter-system mail, and remote execution of programs. The *Remote Access Users Guide* has instructions for setting up *UUCP*. *UUCP* can be used for directly connected serial ports as well as over modems. *UUCP* is a batch-oriented subsystem in that requests can be queued up and then at some later time (if desired), the remote system will be dialed and all work that either system has for the other will be transferred. *UUCP* has its own security, which permits the administrator to allow or disallow any directory access or command execution for any system individually.

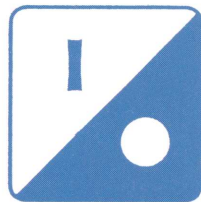
UUCP works over serial ports either directly or via modems and will dial, log in, and transfer data without manual intervention. It requires that the incoming ports be set up to accept terminal access with a *getty*. Outgoing ports are set up by *UUCP*'s configuration files.

The biggest problems with *UUCP* are caused by improper modem setup and failure to set up remote system permissions properly.

SLIP

SLIP permits the Advanced Research Projects Agency (ARPA) programs and protocols to be used over a dialup serial line. Programs such as *ftp(1)* file transfer, *SMTP* (mail), and *telnet(1)* terminal emulation as well as utilities that use the ARPA protocols (such as X Window) can simultaneously share a single dialup connection between two systems using the same capability provided over a local area network. Note, however, that *SLIP* uses packets of data and is therefore very slow over anything but the fastest modems and is further degraded when multiple applications share a port. Remember that LAN connections are typically 10-MBit, but serial ports may be only 9.6-Kbit, a thousand times slower.

Generally, RTS/CTS flow control is recommended for *SLIP* as it permits full binary data transfer over high-speed error-correcting modems.



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Communicating to Miscellaneous RS-232 Devices

Communicating through the serial ports to various devices may involve writing your own program or just using system commands to read or write to a port.

Writing Your Programs

When writing your own programs to communicate to a serial port, you can use *ioctl(2)* calls to program the port or rely on using the *sleep/stty* setup to avoid having to address the issue. The method chosen will depend on whether you wish to do it quick and simple or whether you need features not provided by standard setups. I highly recommend that readers find a good book on serial port programming in UNIX and use those programs as a basis for writing their programs. HP-UX used to have (in 1986) an excellent manual called the *Asynchronous Communications Manual*, which had an outstanding discussion of serial data communications, port parameters, and protocols as well as sample direct connect, modem control, and *pty* programs. However, the manual quickly became obsolete and there is no replacement. If you can find a copy of that old manual, it is very instructive, even if some information is obsolete.

Using Commands

Many applications that require the use of serial port communications can be used without the need to write custom programs. The *sleep* and *stty* commands will hold open and program the port, respectively. Commands such as *dd(1)*, *cat(1)*, *echo(1)*, and the read capability in the Bourne/Korn shells can be used to do input from or output to a serial port. In many cases, this suffices. Users have used these commands to read data from such things as digital scales.

Serial Port Security

There are a number of files and programs associated with serial port security. The */etc/securetty* file lists those files on which a user can log in as root. If this file does not exist, then anyone can log in as root on a serial port. If this file is there, only those ports listed in the file will allow root login. This does not prohibit the user from using the *su(1)* command.

The */etc/dialups* file lists those ports on which a user must enter a second password (called the dialup password) contained in the file */etc/d_passwd*. These two files normally do not exist and the system administrator must create them if wanted.

The *ct(1)* program allows the system to dial a phone number and initiate a *getty* login process after connection. It can, for example, be used in a customized script to limit logins or simply to dial a user at a certain time when set up with *cron(1M)*.

Another method used to control port access is the use of the init states. If there is, say, a *getty* on a port in state 3 but not in state 4, changing to init state 4 will kill the *getty* process and prevent logins. Init states can be used to allow login from modem or physically remote terminals connected via serial ports only when desired. The administrator can use *cron* to change the init state automatically late at night to allow or disallow remote access at certain times.

Documentation and Information

I have mentioned a number of articles from previous issues of *hp-ux/usr* magazine. In addition, the following are primarily or exclusively associated with serial port usage:

Remote Access Users Guide—provides modem, *kermit*, and *uucp* setup and usage.

uucp(1), *uucico(1M)*, etc.—manual pages for the UUCP subsystem.

umodem(1)—manual page on the Xmodem protocol program.

ct(1)—manual page on the callback program.

kermit(1)—manual page on the provided Columbia University C-Kermit program.

cu(1)—manual page on the call unix program.

stty(1)—manual page on the program which sets serial port parameters.

modem(7), *termio(7)*, *termiox(7)*—manual pages on the modem and terminal.

dial(3C)—system call for dialing out on modem port.

/usr/lib/dialit.c—source of dialit program. Source provides example of callout utility. Dialit used to be used by UUCP subsystem.

uugetty(1M), *getty(1M)*—manual pages for programs which initiate login on ports.

gettydefs(4)—manual page for */etc/gettydefs* file, which provides parameters used by *getty* and *uugetty* for initializing serial ports.

dialups(4)—manual page for */etc/dialups* and */etc/d_passwd* for an extra layer of security; used primarily for modems but can be used for any port.

term(4), *terminfo(4)*—manual pages for terminal type database.

ttytype(4), *ttytype(1)*, *tset(1)*—file and programs for setting up terminal type and certain *stty* parameters.

Summary

By understanding all the potential uses of serial ports, the administrator or user can take advantage of two high-performance serial ports that come standard on most HP 9000 Series 700 workstations. In a typical personal computer, one slow serial port is usually provided, with a second one normally consumed by the mouse. On a Series 700, both are available at no additional cost. They shouldn't be wasted. ■

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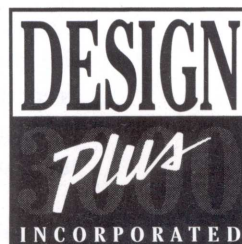
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Runtime storage management is one of the fundamental concerns of the programming language designer. The storage management policies chosen by the designer play a major role in determining the characteristics of a given language, as well as defining certain limitations of the language. Storage management is of equal concern to the language implementor, who must derive the “virtual computer” needed to support the language’s semantic constructs and, ultimately, to realize the language implementation on a given computer. Even for the end user, the programmer, it is important to understand the underlying implications of the storage management policies of a programming language when considering the implementation of that language on a particular hardware platform.

Runtime storage consists of the memory space needed for the program’s executable code and data. Data storage includes static storage, which can be allocated at program load time, and dynamic storage, which is allocated as needed during program runtime. The types and characteristics of the user-defined data objects allowed in a language, and the methods provided for subprogram invocation and parameter passing, can directly affect the type and amount of storage required for a program. This article examines these aspects of storage management in the C programming language, as implemented on the HP 9000 computer system running the HP-UX operating system. First, the impact that certain types of user-defined data objects have on storage management will be considered; then focus will turn to the handling of the central data stack for procedure calling and parameter passing. Finally, a simple C program will be analyzed in detail to demonstrate how the runtime stack is used to provide for its dynamic storage needs.

C Runtime Storage and Function Calls

As previously mentioned, runtime data storage can be classified as static or dynamic. C provides for the former by defining a static, or global data storage area, and for the latter through the management of a central data stack (Kernighan and Ritchie 1). The language compiler can account for all static data at compile time, and thus the global storage can be allocated at program load-time. Dynamic storage is



C RUNTIME STORAGE MANAGEMENT ON HP-UX

R. Stephen Tuttle



Photo by Pierre-Yves Gaenec

allocated on the data stack when a program block, or function, is entered. This applies to the *main* program as well as subprograms, since a C program is elementally a collection of functions including exactly one function called *main()*. C program variables declared outside of any function are, by definition, global, and receive the default storage class of *extern*. Additionally, C provides the storage class designators *auto* and *static*, which allow the programmer explicit control over the storage characteristics of variables declared inside function bodies.

The default storage class for variables declared inside a function body is *auto*, or automatic. Automatic variables are strictly local in scope to the function in which they are declared, and space for them is allocated on the stack when the function is invoked. The lifetime of an automatic variable is that of the function itself. In other words, its storage is deallocated upon completion of the function. This behavior can

TABLE 1 *General Register Usage Conventions*

REGISTER NAME	OTHER NAME	USAGE CONVENTION
gr0		Zero value register
gr1		Scratch register
gr2	RP	Return pointer/scratch register
gr23	arg3	Argument register 3
gr24	arg2	Argument register 2
gr25	arg1	Argument register 1
gr26	arg0	Argument register 0
gr27	DP	Global data pointer
gr28	ret0	Function return register
gr30	SP	Stack Pointer

Source: Hewlett-Packard, *PA-RISC Procedure Calling Conventions Reference Manual*(3-5)

TABLE 2 *Elements of a Single Stack Frame Marker*

SP-32	External Data/LT Pointer(LPT) *
SP-28	External sr4/LT Pointer(LPT') *
SP-24	External/stub RP(RP') *
SP-20	Current RP (return pointer)
SP-16	Static Link
SP-12	Clean Up
SP-8	Relocation Stub RP(RP'')
SP-4	Previous SP
SP-0	Stack Pointer(points to next available addr.) <top of frame>

* used in external references (e.g., shared library calls)

Source: Hewlett-Packard, *PA-RISC Procedure Calling Conventions Reference Manual*(2-3)

be altered by explicitly declaring the variable's storage class to be static (e.g., `static int var1;`). The scope remains local to that of the function, but the lifetime of the variable now becomes that of the program itself. Once a value has been bound to a static variable, the value will be retained until it is changed by a subsequent invocation of the defining function (Kalin and Johnsonbaugh 193-198). Storage for static variables, like that for external variables, must be allocated in the global storage area.

Initialization of arrays in C has interesting ramifications with respect to storage management. In traditional C (sometimes known as K&R C, after its creators, Brian W. Kernighan and Dennis M. Ritchie), only arrays of storage class *static* or *extern* can be initialized within their definitions (Kernighan and Ritchie 83). ANSI standard C, on the other hand, also allows initialization of automatic arrays (Kalin and Johnsonbaugh 283). Although storage class *auto* would seem to imply the storage for the

initialized array is allocated only on the runtime stack, the initialized array is stored in the static global data area and is copied to the stack upon entering the function that declares the array.

Another interesting aspect of array treatment in C is that an array is not seen as a composite data object; rather, an array name is simply a constant pointer. This arrangement precludes atomic operations on an array, such as assignment. Although a pointer variable can be assigned the same address as the array name, the constant pointer array name cannot be changed. The implication of this as far as storage management is concerned is that although C uses "call by value" for function parameter transmission, when array function parameters are passed, it is the location of the array that is passed, not its contents (Kernighan and Ritchie 94). Since the array contents are not copied to the stack, less stack space is needed, but this carries the side effect that the data in the calling function's array can be manipulated by the called function and thus the data cannot be protected.

Unlike languages such as Pascal, C is not block-structured. This means that functions cannot be defined within other functions (Kernighan and Ritchie 81). Therefore, the handling of scope rules at the data stack level is greatly simplified since no static chain structure must be maintained to resolve nonlocal references. The scope of local automatic variables is that of the defining function, and global variables can be referenced from any function.

Function arguments in C are passed by value (Kernighan and Ritchie 71). Call by reference can be achieved indirectly by passing the address of a data object as the "value" to a function formal

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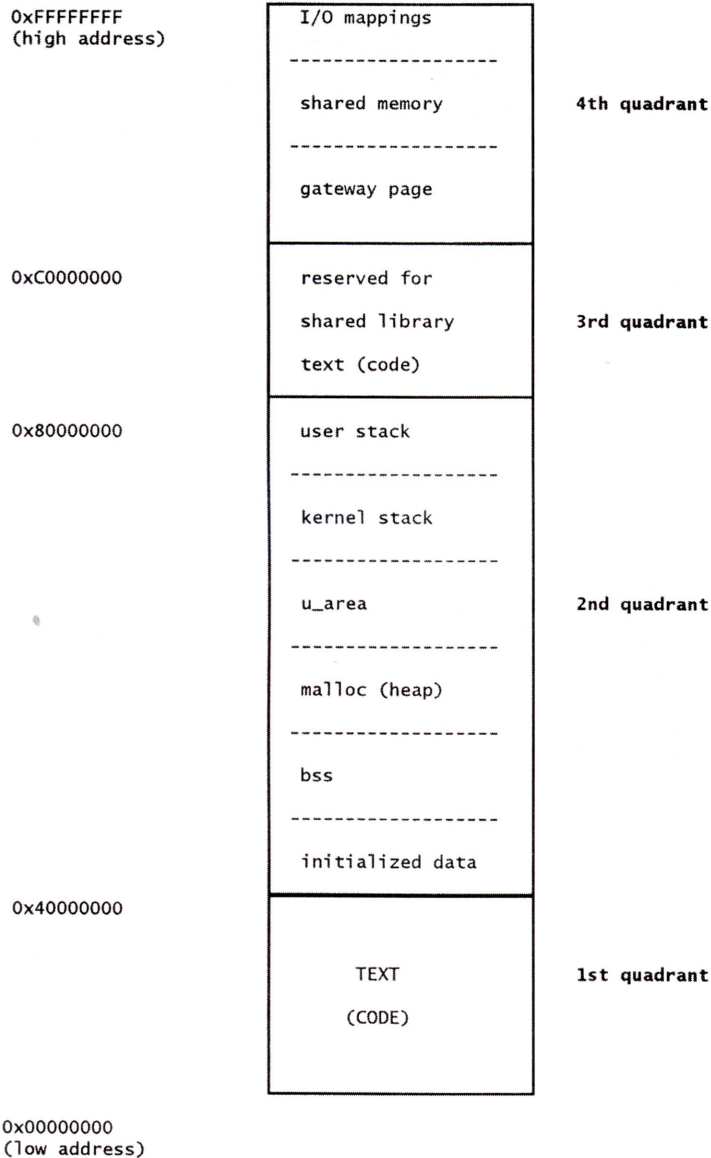
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FIGURE 1 *User Process Virtual Address Space*

Source: Hewlett-Packard: *How HP-UX Works: Concepts for the System Administrator* (7-21)

parameter of type pointer. The function arguments are copied to the data stack during the function call in typical C implementations. Thus function invocations are given private data storage areas on the stack. Use of the stack in this manner allows functions to be called recursively (Kernighan and Ritchie 84).

Stack Allocation

The method of stack allocation used in C for facilitating function calls and parameter passing will now be examined more closely. The discussion here looks at stack allocation from a general, C language viewpoint; afterwards, details of the HP-UX C implementation will be considered. The data space allocated on the runtime stack for various function invocations is delineated by activation records. Each function invocation has its own activation record and may have extra storage for local variables. Minimally, one pointer, called the stack pointer (SP), is maintained and always points to a particular location in the activation record of the most recently called function. This demarks the current referencing environment. Typically, a C activation record consists of at least the following information:

- the values of the actual parameters passed to the function
- the return address to the calling sub-program
- the function return value
- the value of the stack pointer for the previous activation record (Aho and Ullman 352)

Local data storage for automatic variables declared in a given function is allocated in the area immediately adjacent to the activation record for that function.

This area may be above or below the stack pointer, depending on the implementation. The first activation record on the stack will be that of function *main()*. When a function is called from *main()*, SP is advanced and the new function's activation record is built. Control is passed to the function by branching to its initial code location. If this function, in turn, invokes another, the process is repeated. As nested functions finish, the stack is "unwound" by decrementing SP, thus deallocating the storage space for each function invocation. This illustrates the dynamic nature of a function's local storage.

The Virtual Computer

Before proceeding to the analysis of a sample program, it is necessary to examine briefly certain aspects of the HP 9000's underlying system architecture and operating system that, in part, define the virtual computer available to the C compiler and that are needed to understand dynamic storage management. The HP-UX operating system runs on the HP 9000 series 700/800 computer systems. These systems are implemented in Hewlett-Packard Precision Architecture (HPPA). HPPA is a 32-bit load/store RISC-based architecture. The architecture is heavily register-dependent,

Selected HPPA Machine Instructions

STW	r,d(s,b)	store word
LDW	d(s,b),t	load word
LDO	d(b),t	load offset
BL	wd,t	branch and link
BV	wx(b)	branch vectored
ADD	r1,r2,t	add

Where:

b	: base register identification
d	: displacement
r	: source register
r1	: first source register
r2	: second source register
s	: space register identification
t	: destination register
wd	: word displacement
wx	: word index

Source: Hewlett-Packard, *Precision Architecture and Instruction Set Reference Manual*.

LISTING 1

```
main()
{
    int fn1(int, int);
    int fn2(int*, int);
    int a,b,c;

    a=1;
    b=2;
    c=fn1(a,b);
}

int fn1(int e, int f)
{
    int d;
    d=e+f;
    fn2(&d,f);
    return d;
}

int fn2(int *g, int h)
{
    *g=h;
    return;
}
```


LISTING 2

```

main
    .PROC
    .ENTRY
(1)   STW %r2,-20(0,%r30)           ;offset 0x0
      LDO 64(%r30),%r30             ;offset 0x4

(2)   LDI 1,%r1                    ;offset 0x8
      STW %r1,-64(0,%r30)          ;offset 0xc
      LDI 2,%r31                    ;offset 0x10
      STW %r31,-60(0,%r30)         ;offset 0x14

(3)   LDW -64(0,%r30),%r26          ;offset 0x18
      LDW -60(0,%r30),%r25          ;offset 0x1c
      .CALL ARGW0=GR,ARGW1=GR,RTNVAL=GR ;in=25,26;out=28;
      BL fn1,%r2                    ;offset 0x20
      NOP                           ;offset 0x24

(13)  STW %r28,-56(0,%r30)          ;offset 0x28

(14)  LDW -84(0,%r30),%r2           ;offset 0x2c
      BV %r0(%r2)                   ;offset 0x30
      .EXIT
      LDO -64(%r30),%r30             ;offset 0x34
      .PROCEND                       ;out=28;

fn1
    .PROC
    .ENTRY
(4)   STW %r2,-20(0,%r30)           ;offset 0x38
      LDO 64(%r30),%r30             ;offset 0x3c

(5)   STW %r26,-100(0,%r30)         ;offset 0x40
      STW %r25,-104(0,%r30)        ;offset 0x44

(6)   LDW -100(0,%r30),%r19         ;offset 0x48
      LDW -104(0,%r30),%r20         ;offset 0x4c
      ADD %r19,%r20,%r21             ;offset 0x50
      STW %r21,-56(0,%r30)          ;offset 0x54

(7)   LDO -56(%r30),%r26             ;offset 0x58
      LDW -104(0,%r30),%r25         ;offset 0x5c

```

Continued

consisting of 32 general registers, up to 32 floating-point registers, 8 space registers, and a number of machine control and status registers. Of interest in the discussion here are the 32 general-purpose registers (gr0–gr31), and to a lesser extent, the 8 space registers (sr0–sr7), all of which are software-accessible.

The space registers are used in resolving virtual addresses. The *Precision Architecture and Instruction Set Reference Manual* describes virtual addressing as follows:

Virtual memory is organized into linear spaces of $2^{32} = 4,294,967,296$ bytes each. Each space is designated by a space identifier, or *space ID*. The object within the space is specified by a 32-bit *offset*. The concatenation of a space identifier and this offset forms a complete virtual address (2-3).

For this discussion it is sufficient to note that some of the space registers are used to track space identifiers and others are used to hold base address offset values for inter-space object references.

The 32 general registers each consist of 32 bits, and thus are word-aligned. The system hardware enforces the convention that gr0 always contains 0. This provides a useful means of clearing other general registers through a register copy from gr0. While there is only one hardware-enforced general register convention specified in HPPA, there are additional register usage conventions provided for software designers.

All memory access in HPPA is done through simple load and store machine instructions, which implies that all computational manipulation of data is performed on data objects contained in SPU

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LISTING 2 *continued*

```

        .CALL  ARGW0=GR,ARGW1=GR,RTNVAL=GR ;in=25,26;out=28;
        BL  fn2,%r2                        ;offset 0x60
        NOP                                ;offset 0x64

(11)    LDW  -56(0,%r30),%r28                ;offset 0x68
(12)    LDW  -84(0,%r30),%r2                ;offset 0x6c
        BV  %r0(%r2)                        ;offset 0x70
        .EXIT
        LDO  -64(%r30),%r30                  ;offset 0x74
        .PROCEND                            ;in=25,26;out=28;

fn2
        .PROC
        .ENTRY
(8)     STW  %r26,-36(0,%r30)                ;offset 0x78
        STW  %r25,-40(0,%r30)              ;offset 0x7c

(9)     LDW  -36(0,%r30),%r22                ;offset 0x80
        LDW  -40(0,%r30),%r1                ;offset 0x84
        STWS %r1,0(0,%r22)                 ;offset 0x88

(10)    BV  %r0(%r2)                        ;offset 0x8c
        .EXIT
        NOP                                ;offset 0x90
        .PROCEND                            ;in=25,26;out=28;
        .END

```

registers. The state of these registers, then, represents the environment of the currently executing code module. If a branch is taken to another code module, this register-based environment may be overlaid by values in the new environment. If it is desirable to resume executing the first module, some provision must be made to restore its environment. Hewlett-Packard provides a complete specification for procedure calling conventions that resolves this dilemma and provides for parameter passing between modules. This specification is detailed in HP's *PA-RISC Procedure*

Calling Conventions Reference Manual.

The software usage conventions assigned to various general registers are a central part of this specification. *Table 1* lists those relevant to this article. The procedure calling conventions also specify the layout and management scheme of the central data stack. A single stack pointer, SP (gr30), is maintained and is always kept 64-byte aligned. An activation record, in HPPA, is referred to as a stack frame. A stack frame consists of an 8-word frame marker and sufficient stack space for the given

procedure's arguments and local data. *Table 2* lists the contents of the frame marker. The frame marker is built at the top of a frame. SP always points to the first unused byte of memory above the frame marker of the frame most recently placed on the stack. Addresses for procedure arguments are allocated in descending order, beginning immediately below the frame marker. Local data is stored between the bottom of the frame and the bottom of the argument list.

Formal parameters (arguments) passed to a given procedure are actually stored in the argument list area below the frame marker of the previous stack frame. Since each procedure can locate the bottom of its frame, it can use a negative offset below this address to access these parameters. Because of this arrangement, a distinction can be made between leaf procedures and nonleaf procedures. Leaf procedures make no additional calls, while nonleaf procedures are nested calls.

The implication of this is that it is not necessary to build a stack frame for leaf procedures—the argument list is contained in the previous frame, and local data can be stored above SP. Referring to *Table 1*, note that the first four words of the argument list for a procedure are always placed in registers gr23–gr26 by the calling subprogram. The calling conventions state that space for these first four arguments must always be allocated on the stack, but that it is optional as to whether or not the called procedure actually copies the arguments from the arg registers to memory storage on the stack. Using registers rather than memory access, whenever possible, increases the speed and efficiency of the call. This brings up an important point: while the procedure calling conventions form the

basis for specifications required by compiler writers for all languages to be implemented on HPPA, some of the conventions produce options that may be tailored to the needs of a particular language implementation.

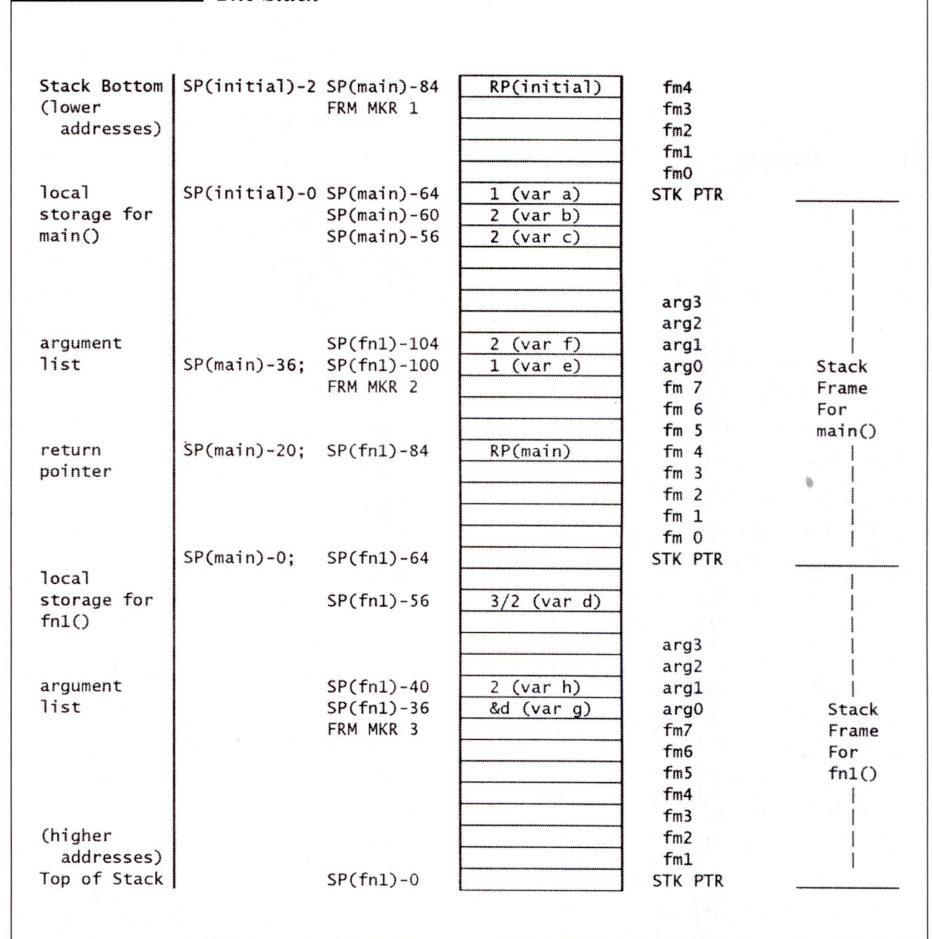
On the HP-UX operating system, a process is an instance, or unique execution, of a program. When a process is created, it is allocated a 4-gigabyte virtual address space. This represents the address range of all objects accessible to the program. This address range is logically subdivided into four 1-gigabyte subspaces referred to as quadrants. *Figure 1* illustrates the mapping of a virtual address space. The process's code is always contained in the first quadrant. The second quadrant contains all process data, including static data, the stack, and the heap. The third and fourth quadrants contain memory mappings managed by the operating system on behalf of the process, such as shared memory and shared libraries (Hewlett-Packard, *Concepts* 7-21).

When a process is active, the base address of each quadrant is loaded into a space register. Thus, any object within a quadrant can be addressed by loading a 32-bit "short pointer" into a general register and using the appropriate space register to resolve the 64-bit memory address. In the program example that follows, it is the data area in the second quadrant that will be of concern, and addresses of memory references will be relative to the base address of this quadrant.

Sample Program Analysis

A simple C program will now be analyzed to demonstrate how the runtime stack is managed to provide for the program's dynamic storage needs. The

FIGURE 2 The Stack



program, called *sample*, consists of the main program and two functions. Refer to *Listing 1*. Function `main()` defines two simple integer variables, `a` and `b`. It then calls function `fn1()`, passing the two integers by value. Function `fn1()` adds the two arguments and stores the result locally in variable `d`. Function `fn1()` then calls function `fn2()`, passing the address of `d` and the value of its formal parameter `f`.

Function `fn2()` has a formal parameter of type pointer to integer, `g`, which is initialized to the address of `d` passed from `fn1`. Function `fn2()` assigns the value

passed in formal parameter `h` to the contents of the location now pointed to by `g`. This modifies the value of variable `d` in the local storage area of `fn1()` and thus demonstrates how pointer arguments can be used to effect a call by reference. Finally, as `fn2()` and `fn1()` return, the stack is unwound and the return value of `fn1()` is assigned to variable `c` in function `main()`. This return value, variable `d` in `fn1()`, was ostensibly the sum of the arguments passed to `fn1()`; however, the subsequent call by reference to `fn2()` causes this value to be changed.

Listing 1 contains the C source code

of *sample*. Listing 2 is an assembly listing of the program and a diagram representing the layout of the runtime stack for an invocation of *sample* is shown in Figure 2. The assembly code in Listing 2 has been grouped into numbered sections of functionally related assembler instructions. The remainder of this analysis consists of an explanation of each of these instruction groups. The

stack diagram has been annotated for clarity. Although there is only one stack pointer (SP) at any given time, the SP-relative address labels in the diagram have been listed in the form, SP(function name), to aid the reader in determining which stack frame the stack pointer in gr30 points to at various times throughout the program's life. This diagram could be thought of as representing what the stack looks like at the end of the program, with the understanding that as each function terminates, SP is decremented and the storage for that stack frame is deallocated. The value stored in SP(fn1)-56 is listed as 3/2 (var *d*) to show that it was modified by the call to *fn2()*. Listings 1 and 2 and Figure 2 accompany the following discussion.

(1) Function *main()*

Store the current return pointer RP (gr2) in the stack frame at SP-20.

Increment SP(gr30) by 64 bytes (16 words) to allocate the stack frame for *main()*.

(2) Store the value 1 in local storage at SP-64 (*a*=1).

Store the value 2 in local storage at SP-60 (*b*=2).

(3) Prepare to call *fn1()* by loading the actual parameters *a* and *b* into registers arg0 and arg1, respectively.

Branch (BL—branch and link) to *fn1()*, placing the current program counter value in RP(gr2).

(4) Function *fn1()*

Store the current return pointer RP(gr2) in the stack frame at SP-20.

Increment SP(gr30) by 64 bytes (16 words) to allocate the stack frame for *fn1()*.

(5) Save the arguments in arg0 and arg1 to memory in the argument spill area of the stack frame: SP-100 and SP-104. These values are now the formal

parameter variables *e* and *f*.

(6) Load *e* and *f* into general registers, add them, and place the sum in local storage at SP-56 (*d*=*e*+*f*).

(7) Prepare to call *fn2()* by loading the address of *d* (LD0 -56 (%r30), %r26 loads the offset of the contents of SP-56) into register arg0, and the value of *f* (LDW—load word) into register arg1.

Branch (BL—branch and link) to *fn2()*, placing the current program counter value in RP(gr2).

(8) Function *fn2()*

Note that *fn2()* is a leaf procedure (i.e., it calls no other procedures). Therefore it is not necessary to save the return pointer (RP) nor is it necessary to build another stack frame by incrementing SP. The function allocates no local storage space.

Save the arguments in arg0 and arg1 to memory in the argument spill area of the stack frame: SP-36 and SP-40. These values are now the formal parameter variables *g* and *h*.

(9) Load the values *g* and *h* into general registers. Remember that *g* is a pointer. Store the contents of *h* at the location pointed to by *g* (**g*=*h*). STWS %r1,0(0,%r22) stores the contents of gr1 at the offset contained in gr22.

(10) Return to the calling function (BV—Branch vectored—relative to the offset in %r2(RP)).

(11) Function *fn1()*

Variable *d* is to be returned. Load its value (SP-56) into ret0(gr28).

(12) Retrieve the return pointer to *main()* by loading RP from the frame marker into gr2.

Branch (BV) to *main()* relative to this value.

Decrement SP by 64 bytes (16 words) to deallocate the stack frame for *fn1()*.

(13) Function *main()*

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Save the return value from *fn1()*, *ret0(gr28)*, in local storage for variable *c* (*c=fn1(a,b)*).

(14) Retrieve the initial return pointer and branch to exit the program, decrementing SP to deallocate the stack frame for *main()*. *Sample* terminates.

The program *sample* provides a simple demonstration of stack management techniques for the C language as implemented for the HP-UX operating system. Clearly, certain instructions in the assembly listing are redundant, and would indeed be removed if the code were optimized by the compiler. In practice, managing the runtime storage needs of application programs is often further complicated by such requirements as having to resolve external sub-program references to shared libraries. This example program, however, helps the reader to gain a better appreciation of the underlying language implementation and its impact on system data storage. A thorough understanding of a system's architectural facilities for managing runtime data storage is obviously a necessity for the language implementor. Understanding storage management techniques is also important for the programmer who wishes to maximize the performance as well as minimize the resource requirements of an application program. ■

An 11-year veteran at HP, R. Stephen Tuttle has been a Response Center engineer for the last eight years. He has provided hardware and software support for the HP 3000 and for the last three years has been supporting users of HP-UX on the HP 9000 platforms.

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Why did my Backup Fail ?

by Wolfgang Friedrich

Most of the operators responsible for backup have probably seen messages like

Error: *Cannot access device*

Warning: *Some of your files have not been backed up*

Fatal Error SE-2314 *occurred in proc.media*

Some of these messages might be self-explanatory and easy to handle. Experience shows, however, that most of these error conditions can lead to a troublesome situation. Especially in unusual error situations the result can be hours and hours of troubleshooting.

Because of the complexity of today's backup solutions, there are many potential problem areas. This article will identify and discuss the most important problems that can lead to a failure of parts of your backup or, in the worst case, of your complete backup. These include trouble with your backup product or with the underlying network, device problems, restrictions of computer resources, and the whole matter of backup policies and their use. In addition to potential problems during backup, the article will also discuss problems that can occur during restore operations.

Recommendations will be made to guarantee trouble-free backup and restore operations.

Backup and Recovery in Complex Environments

In today's system environments, backup is usually a task that is performed in networks of different machines. These

machines may include entry-level systems such as PCs, mid-range systems such as workstations, and high-end mainframe systems. Several heterogeneous systems are connected on a local or wide area network. A typical UNIX environment may contain a huge amount of data, even data that must be online for 24 hours a day. Networks are growing every day both in terms of their capacity and in the type of machines and devices they support.

The backup in such an environment may be a network file system backup of multiple machines. In this case backup devices are shared. Another approach is a

local high-speed backup of raw data where no networking is involved. No matter which backup method or backup tool is being used, the major requirements for the backup operation are

- data integrity and security
- reliability
- high performance
- implementation of full and incremental backups
- some kind of media management
- complete backup and restore management system

Most system managers expect a complete backup in a network environment to be managed by their operators. However, because of the complexity of the underlying hardware and software, errors and instabilities may occur in different areas.



I want to distinguish among the following potential problem areas:

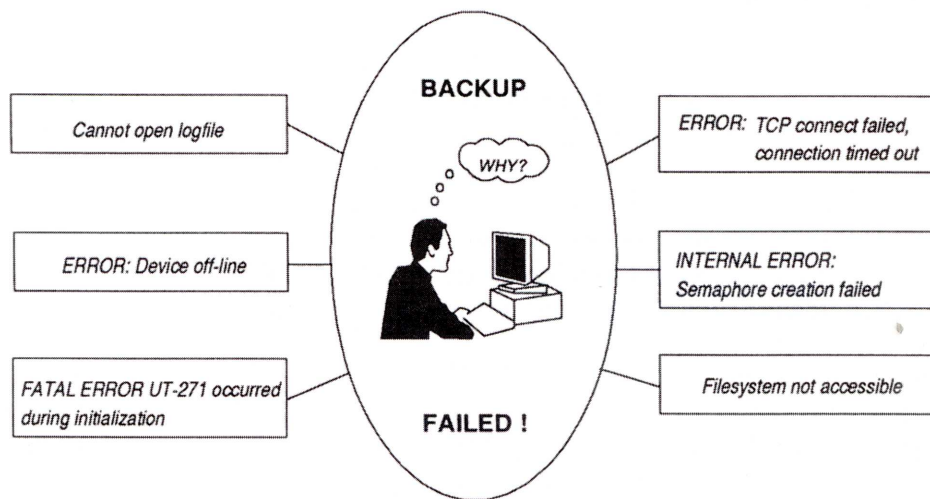
- the backup product
- computer resources
- network services
- the backup policy
- backup media
- backup devices
- restore operations

The Backup Product

The operating staff must have a thorough understanding of the backup product and the processes involved, especially for restore operations, which occur less frequently than backup operations. It is very easy to set up a restore command that accidentally overwrites a complete directory structure or a complete disk. In a data center environment, the operators must be well trained on the product and understand the underlying concepts. The software must be correctly installed.

Software updates are a common source of errors with the backup product itself. These updates can involve the backup product, the operating system, or other software necessary to execute the backups correctly. Especially for network backups, you must ensure that all layers of network software necessary for the backup are up and running. When performing an operating system update, you must check that your backup product supports the new release and that it is compatible with older operating system versions in the network.

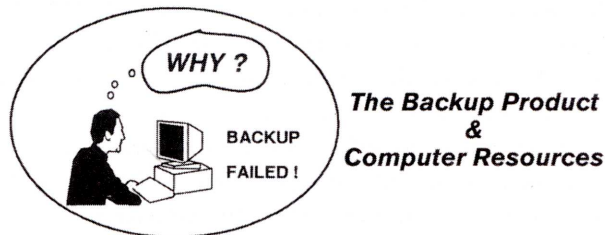
The backup product must be able to handle files that are larger than the capacity of one device medium. For example, if you have a file that is 400 MB in size, the backup product must be able to span that file over multiple MO (Magneto Optical) disks, which hold only 325 MB per disk.



Computer Resources

Some backup products use computer resources extensively. For example, if you use a product for a high-speed local backup to multiple backup devices, you can achieve a backup performance of up to 20 GB/h. To achieve this performance, some computer resources will exceed the default values. These resources can be parameters for shared memory or semaphores.

If during the backup log entries are created for all files that are backed up, you must make sure enough disk space is



- Backup software not correctly installed
- Backup software does not work with OS release
- System parameters like shared memory not sufficient
- Not enough disk space for log entries

available for these log entries. It would be very annoying if your backup failed just because you experienced a file system or database overflow because of the log entries.

Unmounted file systems can also cause trouble. If an unmounted disk holds a file system, the file system will not be backed up if the backup is a file system backup. To avoid this situation, you must make sure that all disks listed in `/etc/checklist` are mounted on your system. During a restore, it can be even worse if you try to restore a file system that is currently not mounted. For example, if your `/usr` directory is on a separate disk and it is unmounted during a restore operation, the restore will be done to the root disk. This can lead to a disk overflow problem if you are not aware of the situation. To guarantee a trouble-free restore, you should again check `/etc/checklist` to find out whether all disks are mounted.

Network Services

Before you do a backup in the network, you must make sure the appropriate network software is up and running in your environment. For the initial setup of your backup environment, you must configure several machines in your network that you want to back up from a central machine. The network services on these machines must be configured accordingly and the central backup machine needs access to the other machines in the backup environment. These machines can be machines that are being backed up or machines to which a backup device is attached.

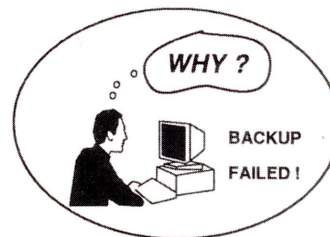
In environments with distributed file systems, you can also do your backup with NFS. However, some older versions of NFS may cause problems when restoring files owned by `root`. The preferred way of doing network backups is always to use a backup product that launches a process locally. This process is responsible for reading the data to be backed up and sending it over the network to the machine with the actual backup device.

In heterogeneous networks you must ensure that the appropriate services are configured for the backup operation. It is strongly recommended that you use a backup product that really exploits the features of network services. These network services could be Remote Procedure Calls (RPCs) or data interchange on the TCP/IP level. If your backup relies on tools like `cpio` or `tar`, you will soon reach limits in terms of network support and other features necessary for backups. These tools have been developed for data inter-

change in the pre-network era, e.g., for transfer of data from a machine of vendor A to a machine of vendor B. Some people use complex scripts around these tools to expand their usage in a network environment. But since these tools were designed neither for network usage nor for the backup requirements of today, the result is always more like a workaround than a sophisticated backup solution.

The Backup Policy

In workgroup environments several people may be responsible for backup policies and procedures. However, it is helpful if there are overall guidelines for the backup procedure so that a company can internally train personnel on the procedure. With this approach it is easier to share resources, people, and computer machinery.



The Backup Policy

- Not all mission-critical user data included in backup
- Important configuration files like `/etc/rc` not backed up
- Backup frequency not appropriate
- End users excluded important data from the backup

One of the major tasks in designing a backup policy is to determine which data needs to be backed up. Typically the important data is user data and application data. The operating system itself does not need to be backed up since it is recoverable from install tapes. When determining what files need to be included in the backup procedure, you must be careful to avoid a possible data loss in the event of corrupted data on the hard disk. Some backup tools allow end users to specify data to be backed up. In this case it is a question of educating the end users to understand what they are requesting for backup. It is the end user's responsibility to make sure all important user and application data is included in a secure backup. Duplicate data that is being backed up from a different place should not

be included in the backup.

The other important issue of a backup policy is the backup frequency. Determine how much data you can afford to lose and plan your backup frequency accordingly. You should also decide if it is really necessary to back up your data every night. If your data changes only infrequently, you might choose to back up only every other night.

If your environment requires a minimal time window for complete file system restores, you must adjust your schedule of full and incremental backups accordingly. For example, if you do full backups every Monday and incremental backups every Tuesday through Friday, it can take hours to restore a complete disk. There are alternatives such as more frequent full backups or local high-speed backups.

Errors in the setup of the backup policy can have very bad consequences. For example, if a user's directory is not included or only partially included in the backup, the data can be lost in the case of a disk failure. Even if you don't back up the operating system, you must include specific files, such as `/etc/passwd` and `/etc/rc`. These files are important for the overall system configuration. It will be very time-consuming to recover a system if the `/etc/passwd` file gets lost.

Backup Media

An important issue concerning backup media is that you be able easily to identify the medium from which you wish to restore your data. Even if the restore operation is sometimes considered an exceptional task, the process of media handling is essential for a trouble-free backup and restore.

There should be a well-defined

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process in place for media handling. This process should cover issues such as

- labelling
- initialization of media
- physical storage
- deletion of obsolete media

The labelling of the media must be correct and consistent. The media should have physical label stickers as well as virtual label information at the beginning of the tape. There must be a clear and simple way to identify a particular medium. The label should consist of information based on the current backup date and the data contained on this medium. In order to guarantee that media are not used for another purpose, the media should be stored in a safe place physically separate from the actual machine environment.

If you use a medium for the first time, you should make sure that it is initialized by the backup tool before the actual backup. In this way you make sure the medium can be easily identified as a medium for backup purposes.

There must also be a process in place to discard backup media that will not be used for backup in the future. Otherwise there is a chance that you could load the tape for a restore and not find the data you actually want to restore. The media must guarantee good data integrity and good shelf life. A procedure should exist to determine how often a specific medium has been used and to ensure it is not overwritten again after it has passed a certain age or usage threshold.

One possible cause of a backup failure is that the capacity of your backup medium is insufficient. You will then see a message telling you that only part of the scheduled data has been backed up. In terms of capacity per medium, the DDS technology offers a cheap and reliable solution. If, however, you want to perform unattended backup of large amounts of online data, you might choose some kind of repository system. In this case the MO (Magneto-Optical) autochanger might be an alternative, since these devices offer an online capacity of up to 100 GB.

Backup Devices

For most environments, the support of a variety of backup devices is available. These devices include the more traditional

1/2-inch 9-track tape and 1/4-inch 16- or 32-track tape drives as well as newer technology such as DAT (DDS Format) tape drives and MO (Magneto Optical) disk drives.

A new compression DAT drive by HP offers a capacity of 8 GB. This amount of data can be stored on a 90-meter DDS tape in a little more than one hour. With this fast developing technology the trend is toward more local high-speed backup

solutions. In some environments a complete backup is only a question of minutes. The advantage is that users can do a fast, reliable backup that is cheap and easy to handle.

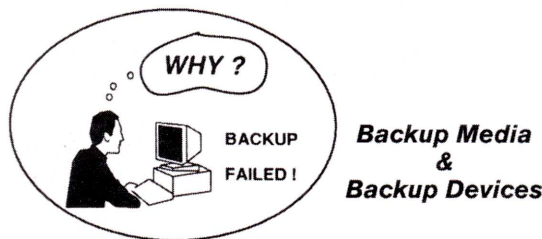
Device files also can cause difficulty. Suppose you do a backup to a drive with the special device file `/dev/rmt/0m`. If this device file has been erased for whatever reason, the result is either a failed backup or a backup into a regular disk file called `/dev/rmt/0m`. This can cause a file system overflow. The same behavior occurs when the device file name is misspelled, e.g., `/dev/rmt/om` instead of `/dev/rmt/0m`.

Another common source of errors is the backup user's not having write access to the device file or the device driver for the backup device not being present. In this case the backup will fail immediately.

Restore Operations

A number of issues concerning restore operations have already been discussed. However, I want to emphasize this particular area because several unexpected errors can occur during a restore operation. I am sure that most operators have already been in a situation where they couldn't do a requested restore or have experienced other unexpected side effects.

Before an actual restore operation is performed, there must be a well-defined way to identify the medium that holds the data to be restored. Usually this is done through the logging information made during the backup. This logging information may be available online on a computer system



- Incorrect labelling
- Capacity of media insufficient
- Device file not setup or not specified correctly
- Device driver not present

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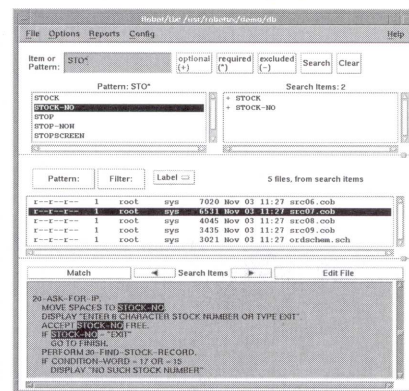
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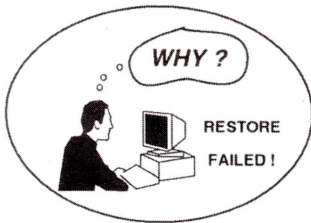
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Restore Operations

- Restore deleted the directory structure
- File system overflow because deleted files are not tracked
- File could not be identified on tape
- Restore done to the wrong machine

or offline on paper or some other medium. No matter where the information resides, there must be an easy and fast way to access it.

A very sensitive matter during the restore process is conflict resolution. A restore conflict exists if the files or directories found on the backup medium already exist on the computer's disk. If the operator does not explicitly specify that he wants to overwrite existing files and directories, the restore will simply not be done. On the other hand, if the operator specifies overwriting during a restore operation, it is very easy to destroy a large amount of data on the disk. Just suppose that you restore a file `/users` to a disk with a directory called `/users`. During the restore, the whole directory `/users` with all underlying directories and files will be removed and replaced by the file `/users`.

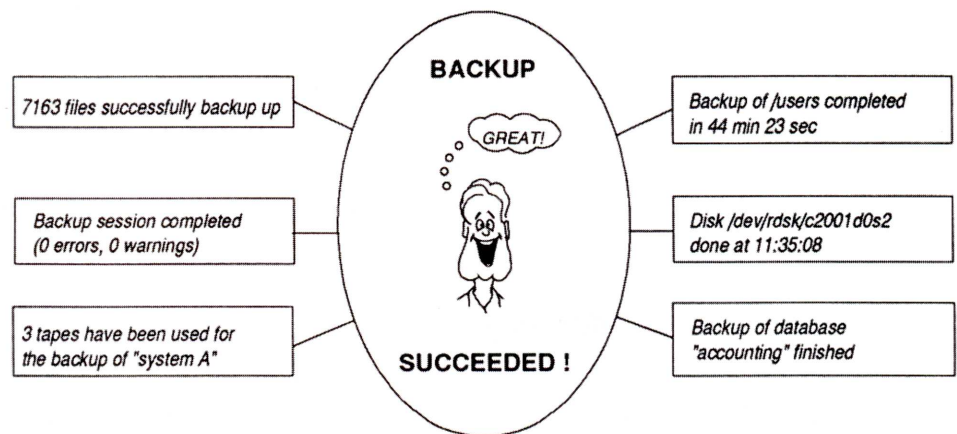
Unexpected file system overflows can also cause a problem, for reasons I have already discussed in the section about computer resources. An additional problem can show up when the backup product does not keep track of deleted files. If all data from a full backup tape and the subsequent incremental backup tapes is restored without the operator taking note of the files that have actually been deleted from the computer's disk, a file system overflow may occur.

When the restore command is entered, the operator must be careful to restore only the precise data necessary. Otherwise, restoring less data will not satisfy the users, and restoring more

data can have other negative side-effects. In addition, the data must be restored to the right location. Especially in a network backup environment, there are many ways of restoring to the wrong place. The data could be restored to a wrong directory or a wrong file system, and it might even be restored to the wrong computer system!

Summary

This article has provided an overview of potential problem areas during backup and restore operations. It is the responsibility of system administrators and backup operators to guarantee a hassle-free operation. In some environments even the end users might be responsible for a successful backup. Most of the issues can be solved through careful planning of policies and procedures. Since backup is one of the most sensitive areas in data center management, the establishment and monitoring of the defined policies and procedures is essential. ■



Wolfgang Friedrich, a native German, holds a master's degree in Computer Science from the Technical University in Aachen. After joining HP in 1987 he held various positions in R&D before he switched to Marketing in 1990. At HP's "Network & System Management Division" (NSMD), he now is responsible for the technical marketing of backup management products.



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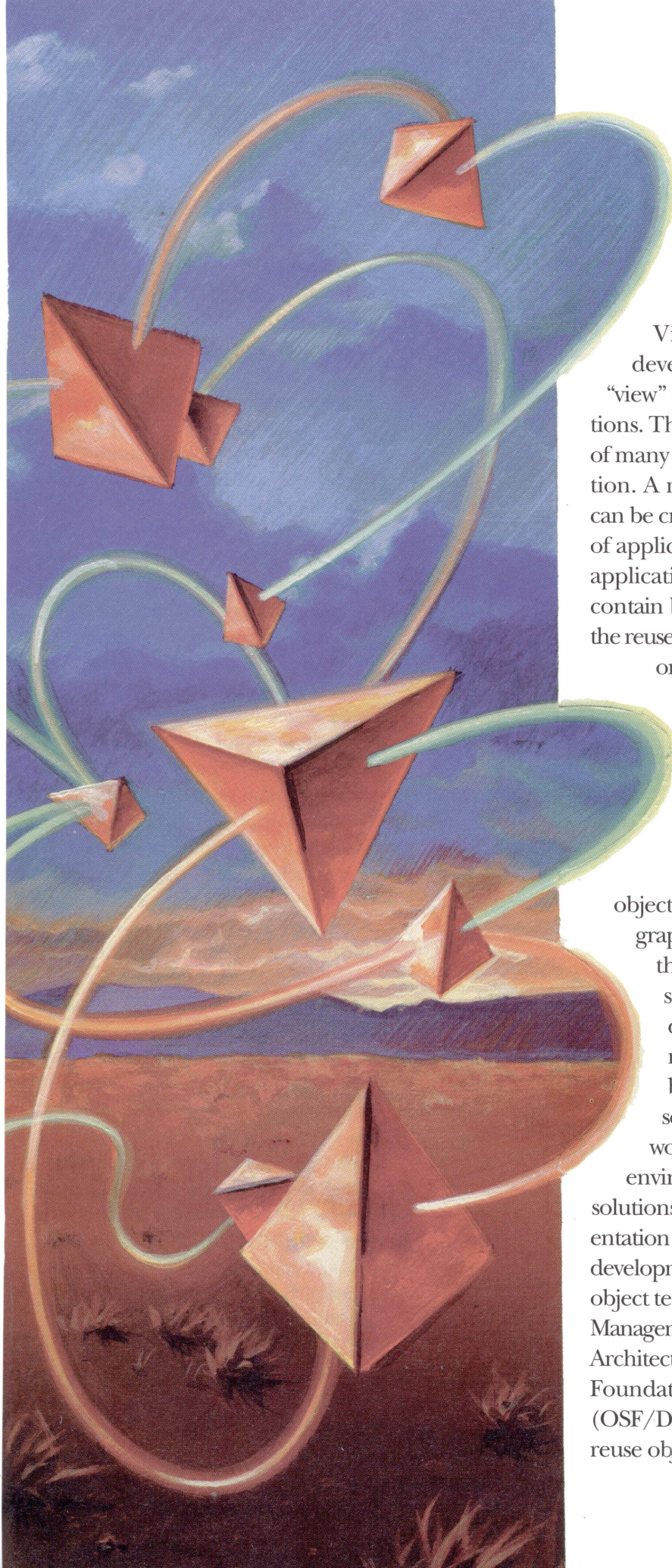
DESIGNING DISTRIBUTED-OBJECT TECHNOLOGY-BASED APPLICATIONS

Graphical User Interfaces are powerful tools in the hands of developers who need to create flexible, easy-to-use applications. These applications become even more valuable and useful when they can provide transparent access to data and functionality spread throughout a company's application networks. In this article, we will examine the contribution that Distributed Object Technology, in concert with Graphical User Interfaces, can make in designing powerful, robust, easy-to-maintain applications that are also easy to use.

Graphical User Interfaces

There are many powerful graphical user interface builders on the market today. They provide everything from a rich array of graphical controls and display formats to a powerful set of visual programming tools to simplify the development of easy-to-use graphical applications. Much of the power of these tools comes from their use of object technology. Graphical controls and windows are generally objects of one form or another. A Microsoft Windows edit window, for example, contains not only a data structure to hold the text, but powerful, editor-like functionality that permits highlighting, word-wrap, insert/delete, mouse usage, etc. This combination of data storage and functionality is a form of object orientation. To take this a step further, if a developer wishes to reuse the functionality of the edit window and enhance it, say to provide tabs, the developer can "sub-class" the edit window and pre-process the tab key, passing the other keystrokes directly into the edit window procedure.

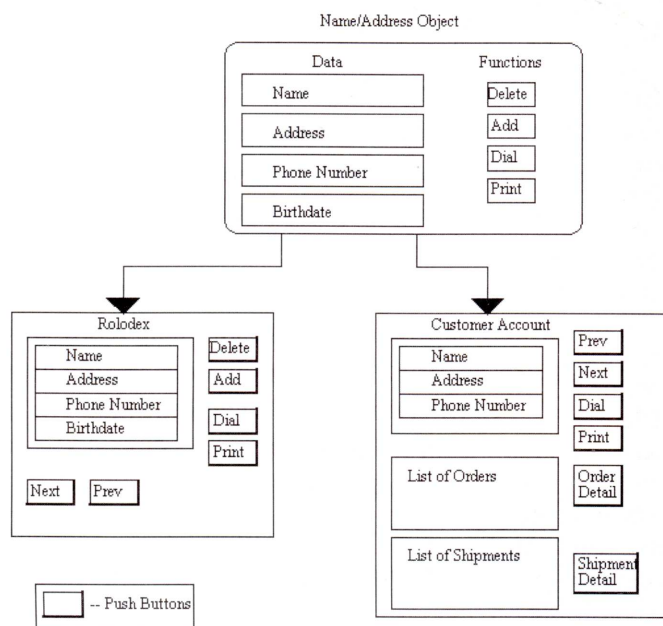
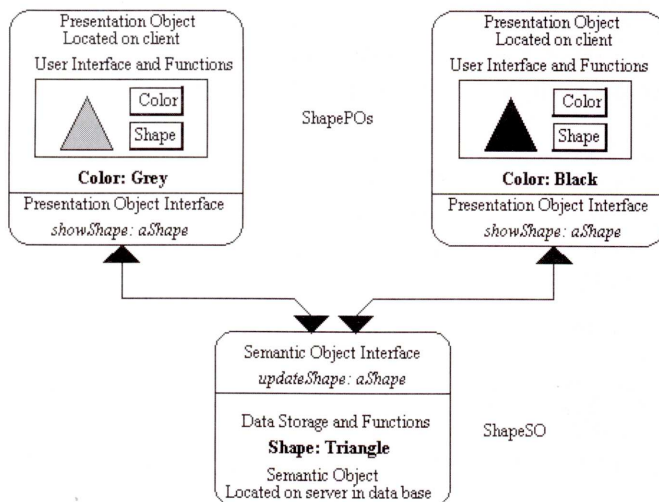
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VisualWorks Smalltalk, for example, the developer can create a simple window object or “view” that can then be reused in various applications. This view can be a composite object consisting of many individual components, both data and function. A name/address/ phone# view, for example, can be created that can then be reused in any number of applications from rolodexes to mainline business applications. This name/address/phone# view can contain basic field validations, simplifying the work of the reuser. In addition, the view can be designed to show only certain fields in a given case. For example, the name/address/ phone# view can have a switch that, when set, turns off the display of the birthdate field. This property of objects is demonstrated in *Example 1*.

Distributed Object Technology

These examples merely hint at the power of object technology to improve the development of graphical applications. An additional problem for the corporate developer is the connection of such graphical applications via LANs to databases on servers. These servers may be mainframes, minis, or micro servers. The databases may be relational, hierarchical, indexed sequential files, or just plain old flat files. Much work has been done to provide links of graphical environments to server databases. Most of these solutions, however, result in the loss of the object orientation that, as shown above, aids so much in the easy development of sophisticated applications. Distributed object technology, such as that provided in the Object Management Group’s Common Object Request Broker Architecture (OMG/CORBA) and the Open Software Foundation’s Distributed Computing Environment (OSF/DCE), is designed to provide the capability to reuse objects across the enterprise network.

EXAMPLE 1 *Reuse of a name/address "View" in More Complex Objects***EXAMPLE 2** *Semantic Object Linked to Presentation Objects Shape information stored in Semantic. Color information stored in Presentations*

Products such as HP's Distributed Smalltalk (HPDS) build on the CORBA/DCE specifications to enable the creation of objects that have a "presentation/semantic" split. The presentation object manages the user interface and the semantic object provides the implementation of the object. For database objects, "implementation" means "how the data is stored." Products like HP's OpenODB object database provide transactional integrity and sophisticated query capabilities for stored objects. This presentation/semantic split permits an object stored on a server to have one or more presentations or views on one or more clients. Look at *Example 2*.

Here a "Shape" semantic object (Shape SO) stored on a server retains the information related to the shape of the object displayed. The color of the shape is stored in the Shape presentation objects (Shape POs). This means that if one user changes the shape, the shape changes in the semantic object and therefore in the presentation objects as well. If a user changes the color in a given presentation object, only the color for that presentation object is changed since the semantic doesn't contain that value. This example is an actual sample application that is distributed as part of HP Distributed Smalltalk. This kind of technology also allows for a semantic object to have links to other semantic objects. For the rest of this article, I will group the CORBA/DCE specifications and the capabilities of the HPDS and OpenODB products into the category of Distributed Object Technology (DOT).

The presentation/semantic split also provides for the creation and sharing of distributed compound documents. Compound documents (which are in the category of "container" objects) are

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CIRCLE 141 ON READER SERVICE CARD

EXAMPLE 3 *Shape Object Embedded in Layout Object. Layout Presentation Object provides a sub-window (display context) for the Shape Presentation Object to display itself in.*

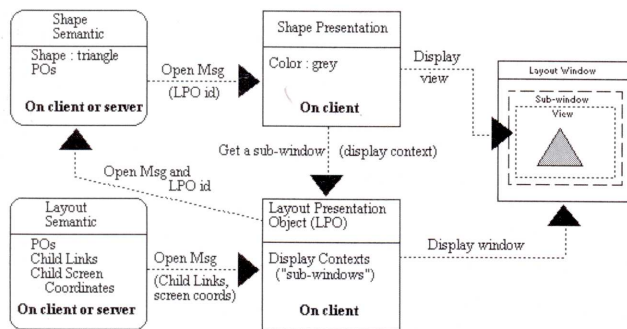


FIGURE 1 *InfoTron Databases*

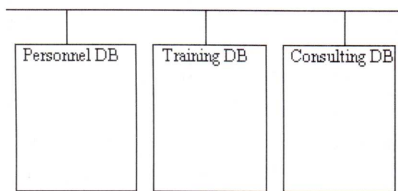
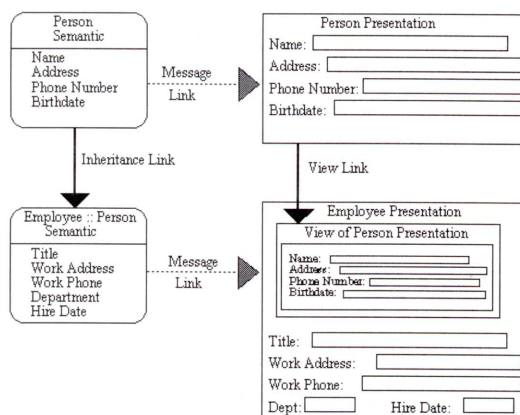


FIGURE 2 *Person Semantic Object is inherited by Employee Semantic Object. Person Semantic Object sends messages to Person Presentation Object. Employee Presentation Object uses a view of Person Presentation Object.*



supported in a windowing environment by a technique known as "clipping." That is, a compound document provides sub-windows known as "clipping regions" or "display contexts" for other objects to display themselves in. The simple objects are passed handles to these sub-windows and use the sub-windows to display information. Using DOT, this process can occur over a network.

For example, a particular spreadsheet graph may be created by a user and shared by a workgroup. The graph may then be embedded by a second workgroup user within a word processing document. The graph then appears as a sub-window in the word processing document. If the graph is updated by the first user, the second user's word processing document is automatically updated.

As another example, the aforementioned Shape objects could be embedded in a compound document such as a "Layout" object (a Layout object is a kind of pasteboard for simple objects, in the category of container objects). If the Shape object is updated (for example, the shape is changed), it will change in the Layout object also. The relationship between the Shape and Layout objects is depicted in *Example 3*.

When the Layout object is opened, the following steps occur. The Layout semantic sends a message to the Layout presentation telling it to open. The Layout SO also passes any child link and child screen coordinate information to the PO. The PO uses the screen coordinates to create sub-windows for the child objects to display their contents in. The PO then opens a window on the display device and sends an open message to any child (or "contained") objects. In this case, only a Shape object is a child. An open message is sent to the appropriate

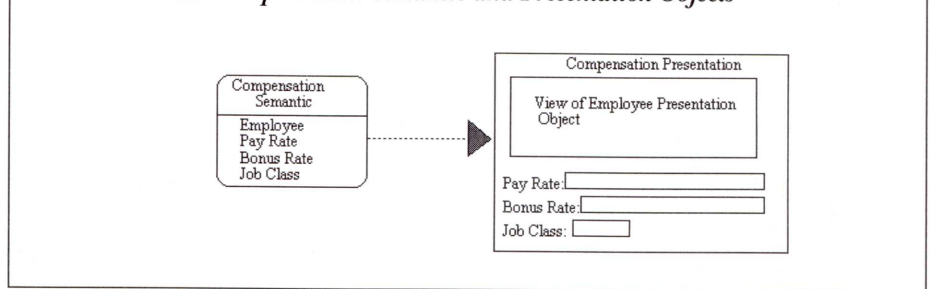
Shape SO. A handle (LPO id) is also sent along with the open message. The Shape SO receives the message and passes it on to the Shape PO. The Shape PO uses the LPO id handle to access the Layout Presentation object and request a display context (sub-window). A handle to the appropriate sub-window (display context) is returned to the Shape PO. The Shape PO then displays a view of itself in the given sub-window. Please note that this can be a "hot-link," in which changing the shape or color of the Shape object immediately changes the view shown in the Layout object.

To describe how applications can be designed with the capabilities of DOT, we'll lay out the design of several simple objects and then combine them to create more complex objects. Many discussions of object technology deal with spreadsheets, graphs, and video and voice data. While these types of discussions are useful, they obscure the significant gain to be made by using object technology in applications that are primarily text based. This discussion, therefore, will deal specifically with textual information (which is still the primary type of information in business applications).

InfoTron Company

Imagine a software/hardware manufacturer called InfoTron. For this company, we will create three databases: Personnel, Training, and Consulting. Each of these databases is on a different server as depicted in *Figure 1*. The databases may be object, hierarchical, relational, or flat files. For the purpose of this article, assume that all databases are front-ended with an object database (odb) so that the developer sees all of the data as if it were stored in an odb.

FIGURE 3 Compensation Semantic and Presentation Objects



Personnel Database Objects

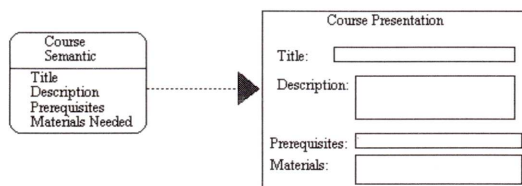
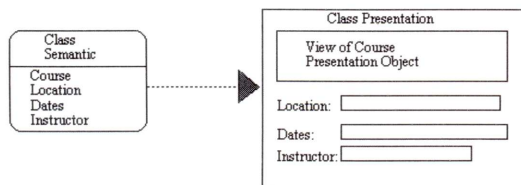
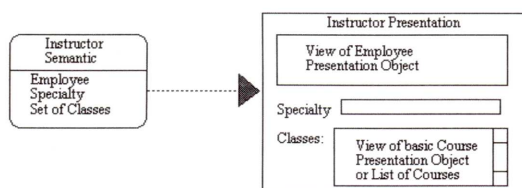
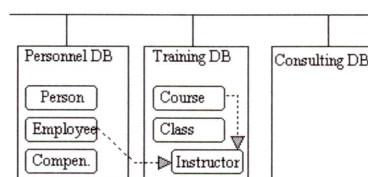
InfoTron's Personnel department has created some simple objects that describe employees: Person and Employee. (Note: For the purposes of this discussion, the term "object" is used to mean both "object class" and "object instance.") The Person object simply has Name, Address, Phone Number, Birthdate, and Marital Status as its attributes. The Employee object is a subclass of Person and therefore inherits all of its behavior. The symbol "::" used in the figure shows inheritance. The Employee object also contains Title, Work Address, Work Phone Number, Department, and Hire Date (*Figure 2*). Each of these objects has a semantic part and a presentation part. The semantic part is stored in an object database on the Personnel Department's server. The presentation part can reside on Windows, UNIX, or OS/2 clients.

The events that occur when an Employee object is activated are as follows. The Employee Semantic Object (SO) on the Personnel DB server activates an Employee Presentation Object (PO) on the requesting client. The Employee SO inherits functionality from the Person SO while the Employee PO provides a sub-window for the Person PO to display itself in. The messages sent by the Employee SO to open the Employee PO also contain the data needed for display. The Employee PO

opens on the client display, using the window formats it stores as well as the data passed to it by the Employee SO.

Personnel has also defined a Compensation Object (*Figure 3*). It contains the Employee object, plus Pay Rate, Bonus Rate, and Job Class. Please note that since a view of a presentation object might be too large to fit into the window provided for it by the other presentation object, the view may include both horizontal and vertical scroll bars. In addition, the Employee view may display only a portion of the data available to the Employee object.

The Compensation object demonstrates reuse of a distributed enterprise object. Both semantic and presentation Employee objects are reused by the Compensation semantic and presentation objects. This is different from the Person/Employee inheritance relationship. The Compensation object in effect provides a region in its display window and gives the coordinates to the Employee object. When the Compensation object activates the Employee object, it passes to it the reference to the Employee data to display as well as a handle to the sub-window in which to display itself. This interface means that the Employee object can change without affecting the internal workings of the Compensation object. If a change is

FIGURE 4 Training Course Semantic and Presentation Objects**FIGURE 5** Training Class Semantic and Presentation Objects**FIGURE 6** Training Instructor Semantic and Presentation Objects**FIGURE 7** Instructor Semantic Linked to Employee and Course Semantics

made to the Employee object, for example, adding Dependents, the enhancement will show up on the Compensation object without any need to change it specifically. This shows a simple case of distributed object reuse, with perhaps a single client and a single server. Note as well that if the Person object were to change (for example, to contain Birth Location), both the Employee and the Compensation objects could automatically reflect this change.

Training Database Objects

To illustrate more significant reuse, that between servers, *Figures 4, 5, and 6* depict the Training Department classes. *Figures 4 and 5* show the Course and Class objects. The Class SO contains a Course SO reference and the Class PO contains a view of a Course PO. The Instructor PO shown in *Figure 6* contains a view of the Employee PO. This means that the Instructor SO must contain a reference to the Employee SO. Note that since the Employee SO is stored on a separate server, there must be a network object link from the Instructor semantic in the Training database. This is depicted in *Figure 7*.

When the Instructor SO is opened, the object's reference (or "link") to the associated Employee SO is accessed. The Instructor SO sends a message to the Employee SO, telling it to open itself as a view in the Instructor PO. The Employee SO sends a message to the Employee PO, which then opens itself as a view within the Instructor PO. The Instructor PO also displays either a basic view of the Course object or a list box view of Course objects. This view is changed dynamically by the Course object. When a view is presented, if a reference to a single object is passed back

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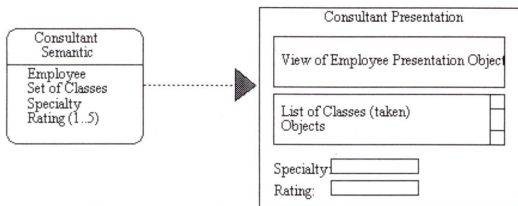
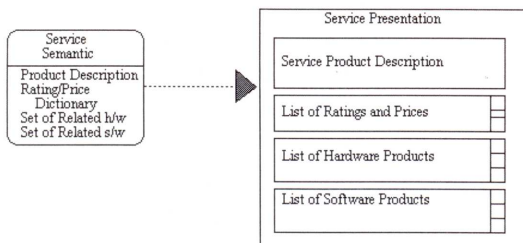
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FIGURE 8 *Consultant Semantic and Presentation Objects***FIGURE 9** *Service Semantic and Presentation Objects*

to the Course SO by the Instructor SO, the Course semantic displays a single Course PO view in the Instructor PO window. If the Instructor SO passes an array or list of Course object references to the Course semantic, the Course SO displays a list box view containing just course name and partial description in the Instructor PO window. If a user were to double click on a selection in the Course view list box, the Course semantic would receive the message and would open a separate Course PO window for the user.

Object Links

A brief digression on object links is in order here. Links between objects can be used for a number of purposes. A link may be used by SOs to display a view of a PO in another PO. A link may be used by an SO to access data from another SO. A link may be used to send

a message to an object to have it perform work, such as displaying itself or updating itself. A message passed using such a link may contain a single simple object or a complex set of objects. Objects may have several links to any number of other objects. This is true for systems such as Smalltalk as well as object database systems. The complex relationships between different types of data in the real world are difficult to model in a simple relational (tabular) or hierarchical model. Storage with an object model that can more easily resemble the real world greatly simplifies the developer's task in creating robust and flexible applications.

Consulting Database Objects

The final objects to look at are the ones stored in the Consulting database. The Consultant, Consulting Service,

and Customer objects complete the database picture. They are illustrated in *Figures 8, 9 and 10*. The Consultant semantic contains an Employee object and a set of Class objects, and the Consultant presentation contains a view of the Employee object and a list view of Class objects (showing the training that the Consultant has had). The Service semantic contains a textual Service Product description and a Dictionary object that consists of Rating/Price entries. This means that for a higher Consultant rating, a higher hourly price is charged for a particular service. The Service SO also contains sets with descriptions of related hardware and software. This is because the service may come with hardware and software products bundled in. The Customer object contains relevant information on Consulting customers.

Figure 11 reflects InfoTron's databases at this point. Not shown in *Figure 11* are the links between the various objects.

System Enhancement: Engagement Objects

Now assume that a user request for a new type of object (screen) is received. The Consultant Managers want an "Engagement Screen." A "Consulting Engagement" is a combination of Consultants providing a combination of Services to a Customer during a certain period of time. Therefore, for a given consulting engagement, the screen should provide information on the customer, a list of the consultants involved, a list of the services provided, and milestone dates for the engagement, as well as a completion flag and a customer satisfaction rating. The request also indicates that

“hyperlinks” between the new screen and other screens (presentation objects) be provided. For example, if a manager double clicks on a consultant selection in the engagement screen, the application should display the basic Consultant screen.

To build this screen, we’ll need to connect to objects in all of the databases previously discussed. In a traditional relational database and 3rd generation language environment, reuse of the database tables and perhaps some reuse of the functionality of the programs would be possible. The rest of the new screen would have to be new code (and remember the network). The objective here, however, is simply to assemble the respective SOs and POs, adding only the code needed to implement new fields, such as the completion flag and customer satisfaction rating. *Figure 12* shows the Engagement SO and PO.

In the Engagement SO, we merely define one single (Customer) and two sets (Consultants and Services) of objects that have been previously defined, in addition to defining a few new objects. In the Engagement PO, we reuse a view of the Customer PO as well as list views of Consultant and Services objects. The Total Price field is calculated by adding the individual prices of the Services objects. The “hyperlinks” requested are automatically implemented via the links present in the views provided by the view objects. By double clicking on a given entry in a list box, the user is able to bring up a detail screen on that selection. For example, if a user were to select a Consultant in the Consultant list box view, the Consultant semantic would receive the message and open a Consultant presentation on that object.

FIGURE 10 *Customer Semantic and Presentation Objects*

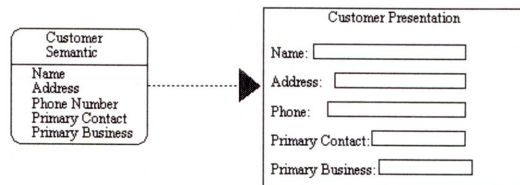


FIGURE 11 *InfoTron's Databases Containing Semantic Objects*

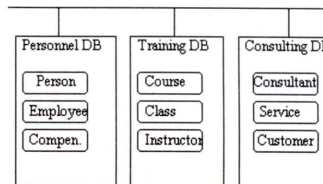


FIGURE 12 *Engagement Semantic and Presentation Objects*

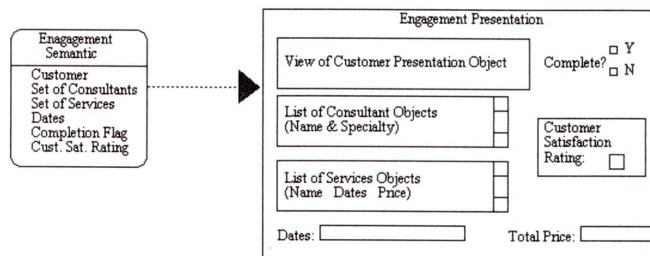
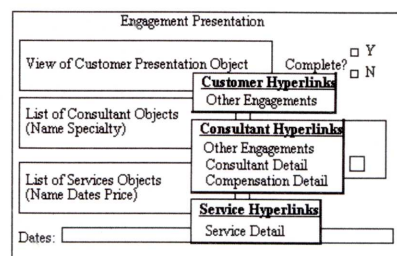


FIGURE 13 *Consultant Presentation Object with Pulldowns for Hyperlinks to Related Objects*



Hyperlinks

These hyperlinks can be extended further. Each basic object can inquire as to all other objects that contain links to it. Assume, then, that the base semantic and presentation classes (from which all SOs and POs inherit functionality) have been enhanced to allow objects to determine what links have been made to them by other objects. For example, the Consultant object will be able to determine that it has been connected to Engagement and Compensation objects. It can then provide a pulldown menu that allows a user to select one of those other objects. For example, given a basic Consultant PO, the user can click the right mouse button on the window. A pulldown menu will appear that lists all of the types of connections available from the Consultant object. Using the above databases, the pulldown will have Engagements and Compensation Detail on it. If the user then clicks on the Compensation item, the Consultant object will pass the Consultant object identifier to the Compensation object and the appropriate Compensation PO will be displayed in a new window.

This idea can be extended to the Engagement Screen enhancement. If a user were to display an Engagement PO for a particular engagement, the user would be able to access the following from that Engagement presentation screen:

- for the Customer, any other Engagement screens
- for the Consultants, any other Engagement screens, related Consultant screens or Compensation screens
- for the Services, any related Services screens

In this way, the system is extended and any new applications can be easily linked

to existing applications. Please note that security on individual objects is necessary since not everyone should be permitted to see the Compensation screen. This type of security can be provided by object databases. Assuming that basic objects have been hyperlink enabled, the Engagement PO might look like *Figure 13*.

Future Capabilities

Given the above capabilities, the future of DOT will bring the following:

1. Distributed Object "painters," similar to today's GUI painters. This type of painter will generate or assemble all of the Smalltalk, C++, ODB, and CORBA language necessary to create a distributed object application. These painters will use business-specific objects created by corporations as well as objects created by vendors. They will use simple, point-and-click programming interfaces that even end users will be able to take great advantage of.

2. Object-oriented, distributed modeling tools that will support a high-level end-user-oriented perspective on business problems. They will generate object "code" incorporating many of the business rules and business data relationships (combined data flow diagrams and entity-relationship models) inherent in business applications. Use of object-oriented modeling combined with object language/database implementation retains the unified data/process model from the beginning of the development cycle through to the end, simplifying maintenance. It also helps solve the problem of doing high-level modeling of distributed (non-mainframe-centric) systems.

Conclusion

Object technology (OT) simplifies the development of graphical applications.

These applications do not need to be graphs, spreadsheets, or voice and video to benefit from graphical displays and object technology. Simple text objects can be associated and manipulated using OT and GUIs in ways that are difficult to achieve with other technologies. Use of Distributed Object Technology extends this ease of development and use to network-based applications. DOT hides the complexity of the network from the developer and end user and permits sharing and interaction of objects among multiple clients with multiple servers. Through the use of object interfaces, links, and views, DOT enables the creation of complex, easy-to-enhance, distributed applications that are also easy to control and understand. Legacy databases can be integrated in the DOT environment and made easier to access and use.

Experience has shown that hiding network complexity from developers and users significantly improves productivity. Studies have shown that improving reuse provides greatly improved software development productivity. Studies have further shown that object technology provides substantial benefit in the area of reuse. Object technology also enables creation of easy-to-build, easy-to-use Graphical User Interfaces.

Distributed Object Technology integrated with Graphical User Interfaces will speed the development of robust applications. Independent software vendors, corporate developers, and end users all will benefit from the availability of this enabling technology. ■

Tim Ryan is a technical consultant with Hewlett-Packard. He has participated in designing and developing online distributed application systems for 14 years. He has been applying object technology to information systems development for the past six years.

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CIRCLE 124 ON READER SERVICE CARD

Performance and Hardware Testing

THIS MONTH WE ARE GOING to look at the tools available with HP-UX for diagnosing disk and CPU load problems. These tools come standard with all HP-UX systems and can provide a good insight into your system without your having to spend any money. I will also follow up my columns on the HPSL and hpux-patch e-mail lists and introduce a new list for HP-UX Systems Admins.

iostat—Disk I/O Statistics

iostat(1) is used to report statistics about each disk local to your system. The *iostat* command has the following syntax:

```
iostat [-t] [interval [count]]
```

The -t option adds statistics for terminals to the disk information. The interval parameter is how often *iostat* is to generate the statistics, and the count is the number of times *iostat* will generate statistics before exiting. If the count is not supplied, *iostat* will continue until interrupted.

All the parameters are optional. If none are supplied, *iostat* returns statistics since the last system boot. If the interval is supplied, after the first report (which contains the statistics since bootup), the statistics are for the previous interval only.

A sample of `iostat -t 2 2` is shown in *Figure 1*. The first report lists the statistics since bootup. In this case the system was only booted for about 18 hours over a weekend, so not much had happened.

The fields of the *iostat* command are:

bps : kilobytes transferred per second
sps : number of seeks per second
msps: milliseconds per average seek

The -t option also adds these:

tin : number of characters read from all terminals
tout: number of characters written to all terminals
us : percentage of time the system has spent in user mode
ni : percentage of time spent running 'nice' processes
sy : percentage of time spent in system mode
id : percentage of time spent idle

How these parameters are calculated is described in the man page.

vmstat—Virtual Memory Statistics

vmstat(1) is used to report virtual memory statistics about the system. The *vmstat* command generates a report about CPU and virtual memory subsystem activities.

The *vmstat* command has the following syntax:

```
vmstat [[-dnS] [interval [count]] | -f | -s | -z]
```


FIGURE 1 *iostat-t 2 2 example*

```

          tty          cpu
        tin tout      us ni sy id
          1  78        3  3  4 90
/dev/*dsk/c0d*s* /dev/*dsk/c1d*s* /dev/*dsk/c2d*s* /dev/*dsk/c3d*s*
bps  sps  mspms  bps  sps  mspms  bps  sps  mspms  bps  sps  mspms
   6  0.5  26.9   20  1.4  27.7   16  1.2  22.5    0  0.0  405.4

          tty          cpu
        tin tout      us ni sy id
          0 1011       2  0 12 86
/dev/*dsk/c0d*s* /dev/*dsk/c1d*s* /dev/*dsk/c2d*s* /dev/*dsk/c3d*s*
bps  sps  mspms  bps  sps  mspms  bps  sps  mspms  bps  sps  mspms
   0  0.0   0.0    0  0.0   0.0    0  0.0   0.0    0  0.0   0.0

```

FIGURE 2 *Output of VMSTAT 2 2*

```

      procs      memory      page      faults      cpu
r  b  w  avm    free  re  at  pi  po  fr  de  sr  in  sy  cs  us  sy  id
0  0  0  2082   20209   4   4   8   0   0   0   0  71 250  43   5   4   90
0  0  0  2082   20180   5   1   6   0   0   0   0  31 224  26   0   0  100

```

The -d option causes *vmstat* to report disk transfer information in transfers per second. This information is appended to the end of the report (*iostat* provides better information, so use that instead).

The -n option causes *vmstat* to format the output to fit in 80 columns; otherwise the data is not nicely formatted.

The -S option causes *vmstat* to report the number of processes swapped in and out instead of the number of pages reclaimed.

The interval and count parameters are the same as for *iostat*.

The -f option causes *vmstat* to report the number of process fork(s) and the number of virtual memory pages used since system startup.

The -s option causes *vmstat* to print current values of all the internal accumulators the kernel is tracking. There is a lot of information about what the kernel is doing in this data.

The -z option clears the kernel accumulators.

An example of *vmstat 2 2* is in Figure 2.

As with *iostat*, the first line is always the statistics since the system was booted.

The procs section lists information about the number of processes that are various states. The subheadings are:

r—the number waiting on CPU

b—the number blocking waiting on a resource

w—the number that are runnable but have been swapped out of memory

The memory section lists information about the usage of real and virtual memory. The subheadings are:

avm—number of active virtual memory pages

free—number of free virtual memory pages

The page section lists information about page faults and paging activities. A page fault occurs when a process attempts to access a memory address that is currently swapped out. The subheadings are:

- re—page reclaims
- at—number of address translation faults
- pi—number of pages paged in
- po—number of pages paged out
- fr—number of pages freed per second
- de—anticipated short-term memory shortfall
- sr—pages scanned by clock algorithm, per second

The faults section lists information about the number of traps and interrupts the kernel processes in a 5-second interval. This statistic is independent of the interval parameter to *vmstat*. The subheadings are:

- in—number of device interrupts per second
- sy—number of system calls per second
- cs—number of context switches per second for the CPU

The *cpu* section lists information about the percentage of time the CPU spends in each of the following states:

- us—total user time (a combination of normal and nice time)
- sy—system time
- id—CPU is idle

How these statistics are calculated is described in the man page for *vmstat*.

top—Find the Hogs ...

With HP-UX 9.0, HP finally “recognized” the importance of being able to determine the top CPU users. The *top(1)* command has been around for a long time (I remember using it on 3.1) as public domain code that someone within HP maintained between HP-UX releases. In 9.0 it is shipped and supported. There is even a man page!

top shows you a list of top CPU users within the system. It shows the name of the user who started the process, the priority of the process and its size, both in memory and in total, and the amount of the CPU it has used. Unfortunately it shows the name of the process as it was started, instead of just the executable name. For example, it shows */usr/vue/bin/hpterm* instead of *hpterm*. Most

of the time the name of the executable is cut off and you must use the PID of the process and *ps* to find the name.

top also shows the amount of memory used and available for the system, as well as the current load and the 5- and 15-minute load averages.

Examining the Data

So, what does it all mean? Using *iostat*, you can determine which disks have the heaviest usage and reconfigure your applications. For example, if you follow the “standard” of installing commercial packages under */usr*; you may notice that the access times on the */usr* disk are very poor. Moving one or more of the disk-intensive packages to another disk will increase response time.

Using *vmstat*, you can determine how much memory your system is using and how often it is swapping. You can also see where the CPU spends its time. If it spends most of its time idle, but waiting on I/O, you may need faster disks, modems, or terminals. The run queue size in *vmstat* is also useful for detecting overloads. If the run queues are more than single digits consistently, you may need additional memory or a faster processor (or find the guys playing games and kick them off).

top is useful for finding the applications that are using the most resources. Unfortunately, you must trace the PID using *ps* to find the name of the process, but it is better than nothing.

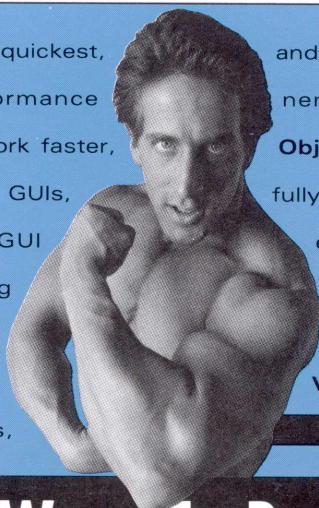
When using these tools to diagnose problems, it is good to have a starting reference point. Monitor your system for a couple of “typical” days and record the average disk and CPU usage and which processes use the most resources. Using this information, you can determine what is causing your system to slow down.

HP also has a suite of tools to help you diagnose system performance problems. I have experience only with the Glance product, but several customers have had good things to say about the other tools. If you like the Glance product but cannot afford it, look for a public domain utility called *monitor*. It performs much of the functionality of Glance, but is free. A nearby FTP site or the CSL library will have it.

HPSL Update

Two issues ago I mentioned the HPSL e-mail service that HP is providing to keep their customers informed of patches and new products. At the time the column was written, I heard several people say that the list was experimental. I asked everyone who uses it to tell their sales contacts how much they liked it. Between the time I wrote that and its publication, HP made a commitment to the concept and the list is now permanent.

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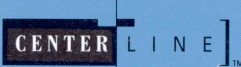


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CIRCLE 145 ON READER SERVICE CARD

hp-ux systems administration

I received several pieces of e-mail from people within HP about the column and I want to thank them for correcting me.

For those who do not know about HPSL, send an e-mail message to:

support@support.mayfield.hp.com

with 'send guide' in the message body. You will receive the user's guide to the service.

End of the hpux-patch Mailing List and the Start of Something New

I am happy (sad?) to report that the hpux-patch mailing list has been removed. Started several years ago by a group of people to share information about HP patches, the mailing list was canceled on May 1. When HP started the HPSL mailing lists, this list became obsolete and the volume dropped to almost none.

Bart Muyzer, who has been responsible for keeping the list going, asked if the members thought it was still necessary. Within a couple of days it was agreed that the list was no longer needed, but interest in another list arose. It seems that there

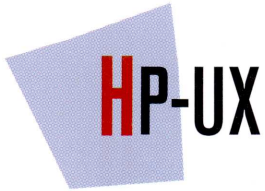
is a sun-admin mailing list used to address issues in Sun systems administration. Someone suggested starting a new list about HP-UX systems administration.

In the message to comp.sys.hp.* news groups and the hpux-patch mailing lists that announced the end of the hpux-patch list, Bart announced the beginning of the hpux-admin mailing list. The purpose of this list is "to discuss matters related to HP-UX system administration." To join the list, send e-mail to hpux-admin-request@cv.ruu.nl

with the command 'subscribe' in the Subject.

To send a request to the list, send it to hpux-admin@cv.ruu.nl. If you have questions about the list, send a note to Bart at owner-hpux-admin@cv.ruu.nl. I want to thank Bart for running the old list and for setting up and managing the new list. ■

Chris Curtin, a software developer for Bradley Ward Systems, Inc. in Atlanta, Georgia, specializes in device driver development for factory automation on the HP 9000. He can be reached via e-mail at: chris@bwilab3.atl.ga.us.



by David L. Totsch

Phantom Files

I WAS MERRILY WORKING on my system the other day, not a care in the world, when I stumbled across something like this:

```
dtotsch> ls data2
data2
dtotsch> cat data2
cat: cannot open data2: No such file or directory
```

Wait just one minute. I can believe a message like "Permission denied" on a file I can list, but "No such file or directory" is what you get when the file does not exist. Here is the catch:

```
dtotsch> ls -l data2
lrwxr-xr-x 1 dtotsch other 8 Feb 10 13:53 data2 -> ../datadir/logA
```

The file was a symbolic link. Unlike hard links, symbolic links can go stale if the file linked to is removed or renamed. Just another thing for system administrators to keep track of.

Keeping track of symbolic links is not an easy task. You can create a direct link to a file (put the full path name to the file into the pointer file), create a relative link to a file (put a relative path to the file into the pointer file—a reference from the present directory), or create a directory link (direct or relative). All of the different methods are useful. They stop being useful when the file linked to is removed or moved, or just never existed in the first place. *find(1)* with the "-type l" option will list the symbolic links, but it will not tell us which links are stale. *ls(1)* with the "-l" option will show us the file it is pointing to, as shown in the example above. You can ask for a listing on the file pointed to, but you get the added problem of a relative link (you will need to *cd(1)* to the directory or append the link name with the directory name). If you have a bunch of symbolic links on your system, this could become a formidable task. So, feel free to pirate the shell script that reports phantom files shown in *Listing 1*. ■

After serving several different organizations over the past seven years as a system administrator with various flavors of UNIX, David L. Totsch still enjoys the profession. He also enjoys discussing UNIX with just about anyone. At present, he is working with HP-UX systems and wide-area networks for a Fortune 100 company in the Piedmont area of North Carolina.

LISTING 1 *Phantom File Shell Script*

```
#####
##### phantoms.sh
#####
##### Locates and reports "PHANTOM" files on the given file systems.
##### Phantom files are symbolic links where the original file has been
##### removed or moved.
#####
#####
#####DATE      PROGRAMMER DESCRIPTION
#####-----
#####01/14/94 dtotsch      ORIGINAL
#####
PROG=`basename ${0}`      ##### The name of this program as it executes
SEARCH="/"                ##### Blank delimited directories to search
FIND_ERRS=/tmp/${PROG}${$_}F ##### A place to put errors from find(1)
LCOUNT=0                  ##### Count of linked files
BCOUNT=0                  ##### Count of bad links found
PRINTED="NO"              ##### Have we printed the header

find ${SEARCH} -type l -print 2>${FIND_ERRS} | while read THISFILE
do
    LCOUNT=`expr $LCOUNT + 1`
    REALLINK=`ls -ld ${THISFILE} | awk '{print $NF}'`
    if [ `expr "${REALLINK}" : "\.\\.\\.\" -ne 0 ]
    then
        LINK=`dirname ${THISFILE}/${REALLINK}`
    else
        LINK=${REALLINK}
    fi
    ls -d ${LINK} > /dev/null 2>&1
    if [ ${?} -gt 0 ]
    then
        if [ "${PRINTED}" != "YES" ]
        then
            echo "${PROG}: PLEASE EXAMINE THE FOLLOWING LINKS:\n"
            PRINTED=YES
        fi
        BCOUNT=`expr $BCOUNT + 1`
        echo "${THISFILE} LINKED TO ${REALLINK}"
    fi
done

echo "\n${PROG}: OF ${LCOUNT} LINKS ON `hostname`, ${BCOUNT} WERE BAD."

if [ -s ${FIND_ERRS} ]
then
    echo "${PROG}: Find had the following errors:"
    cat ${FIND_ERRS}
fi

rm -f ${FIND_ERRS}
```


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In this presentation, James Lofink of Operations Control Systems will examine ANSI/IEEE requirements for configuration identification, baseline management, library control, status accounting, reviews and audits, change control, testing, and release to production.

For more details about these and other tutorials, presentations, and roundtables on open systems and standards, see the “Open systems and Standards” section on page 43 of your Interex '94 Registration brochure. Call 1.800.468.3439, or e-mail conference@interex.org, for your free copy.

The New Computer Graphics Metafile Standard

In 1992, ISO gave its final approval to ISO/IEC 8632:1992, the standard for computer graphics metafiles (CGM) and the only ANSI and ISO standard for the

interchange of vector and integrated raster computer graphics pictures. The new standard is a superset of and replaces ISO/IEC 8632:1987. In this presentation, John Gebhardt of InterCAP Graphics Systems will discuss examples which show how the new capabilities will make the interchange of virtually all types of 2D graphics—vector, raster, and hybrid—more efficient and reliable.

Gebhardt will describe the many new features of CGM:1992 and discuss in some detail how the new standard is currently being applied and future impacts of the standard in the commercial aerospace industry and in the CALS program.

Developing and Certifying OSF/Motif Applications

Learn how the OSF/Motif Style Guide defines the “look and feel” of an OSF/Motif Application.

Natasha Flaherty, Oracle Corporation, will cite examples from her own experience developing and certifying an OSF/Motif end-user application.

Keynote and Plenary Speakers

Keynote and plenary speakers will give you cutting-edge information designed to enlighten, entertain, and empower you to implement their ideas.

Willem R. Roelandts, Sr. Vice President and General Manager, Computer Systems Organization, Hewlett-Packard Co., will deliver a key message from Hewlett-Packard on the company's Computer Systems Organization.

Mark Sanborn, Principal, Sanborn & Associates, will offer solutions on how to use the information you learn at Interex in your daily life.

Dr. George Schussel, Chairman, Digital Consulting, Inc., will present a technology tour of the latest in application development. You will learn what's hot and what's not in client-server computing, database replication, object environments, and more!

Dale Williams, Executive Director, National Information Infrastructure Testbed, will address the substance behind the hype of the “information superhighway.” He will discuss such

urgent questions as: What is the “data superhighway”? Who will pay for it? How can you get involved?

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Hewlett-Packard Future Directions Plenary Sessions—Hewlett-Packard offers three sessions on the latest products and future directions for HP-UX servers, MPE/iX, and workstations.

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Deborah Nelson, Hewlett-Packard Co.

Developers with Three-Tiered Client-Server Architecture and DCE: Nightmare or Nirvana?

Peter Duffey, Progress Software

The OSF/Motif Style Guide and You: Developing and Certifying OSF/Motif Applications

Natasha Flaherty, Oracle Corporation

Meeting ANSI Standards for Software Configuration

James Lofink, Operations Control Systems (OCS)

Evolving ODBMS Standards

Andrew Wade, Objectivity, Inc.

Integrating UNIX Workstations, Personal Computers, and Macs

Brad Feazell, Dril-Quip, Inc.

Tuning the HP-UX High Performance File System

Glen Johnson, Computer Solutions, Inc.

The New Computer Graphics Metafile Standard

John Gebhardt, InterCAP Graphics Systems

Client-Server and Rightsizing, Open Systems Challenges and Solutions

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Check one

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 - ☐ CFO/Controller (903)
 - ☐ CIO/MIS Director (904)
 - ☐ MIS Manager (905)
 - ☐ MIS Staff (906)
 - ☐ Operations Manager (907)
 - ☐ Scientist/Researcher (908)
 - ☐ Systems Manager/Administrator (909)
 - ☐ Communications/Technical Mgr (910)
 - ☐ Systems Analyst (911)
 - ☐ Programmer (912)
 - ☐ Operator (913)
 - ☐ Consultant/Educator (914)
 - ☐ Other Manager (915)
 - ☐ Other (999)

2.

- Number of HP computers at your site:**
- ☐ HP3000 MPE (101)
 - ☐ HP3000 MPE/XL/iX (102)
 - ☐ HP9000/800 Series (103)
 - ☐ HP9000/700 Workstation (104)
 - ☐ HP9000/300-500 (105)
 - ☐ Apollo Workstation (106)
 - ☐ HP1000 (107)
 - ☐ HP Vectra (108)
 - ☐ HP X-Terminal (109)
 - ☐ None of the above (100)
- Currently have/use** ☐ **Plan to upgrade/purchase** ☐
- Use numbers for all that apply

3.

Check all that apply

- Operating systems/environments at your site:**
- ☐ MPE V (201)
 - ☐ MPE iX (202)
 - ☐ HP-UX (203)
 - ☐ Domain (204)
 - ☐ RTE (205)
 - ☐ MS-DOS (206)
 - ☐ UNIX (Non HP) (207)
- Currently have/use** ☐ **Plan to upgrade/purchase** ☐
- continued

3. continued

- Operating systems/environments at your site:**
- ☐ MVS or VM (IBM) (208)
 - ☐ VMS (DEC) (209)
 - ☐ OS/2 (210)
 - ☐ MS Windows (211)
 - ☐ Windows NT (212)
 - ☐ X Window (213)
 - ☐ Macintosh (214)
 - ☐ NeXTStep (215)
 - ☐ CICS (216)
 - ☐ Other: (299)
- Currently have/use** ☐ **Plan to upgrade/purchase** ☐

4.

- Number of non-HP computers at your site:**
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 - ☐ DEC VAX (302)
 - ☐ DEC Alpha (303)
 - ☐ IBM Mainframe/Compatible (304)
 - ☐ IBM 3X (305)
 - ☐ IBM AS/400 (306)
 - ☐ IBM Workstation (307)
 - ☐ Intel-based Servers (308)
 - ☐ Macintosh (309)
 - ☐ NCR/AT&T 3B (310)
 - ☐ PCs, Intel-based (311)
 - ☐ PCs Alpha/Power PC (312)
 - ☐ Prime (313)
 - ☐ SGI/MIPS (314)
 - ☐ Sun Sparc/Compatible (315)
 - ☐ Tandem (316)
 - ☐ Unisys (317)
 - ☐ Wang (318)
 - ☐ Other: (399)
- Currently have/use** ☐ **Plan to upgrade/purchase** ☐
- Use numbers for all that apply

5.

- Primary Type of Business**
- ☐ Manufacturing: Process (30A)
 - ☐ Manufacturing: Discrete (non-computer) (30A)
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 - ☐ Reselling/VAR: Computers/related (357R)
 - ☐ Distribution: Wholesale/retail (50A)
- continued

5.

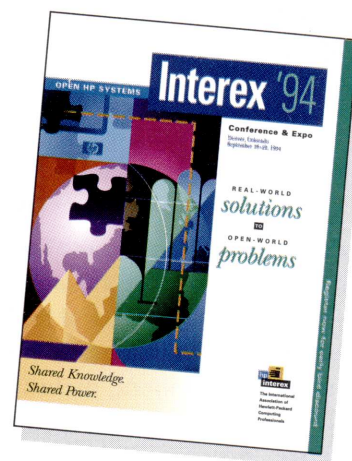
- Primary Type of Business**
- ☐ Trade: Wholesale/retail (50B)
 - ☐ Government: Federal (919A)
 - ☐ Government: State/Regional/Local (919C)
 - ☐ Transportation (47)
 - ☐ Utilities (49)
 - ☐ Automotive/Aerospace (372)
 - ☐ Electronics (36)
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| Peripherals (1003) | <input type="checkbox"/> | <input type="checkbox"/> |
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7.

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 - ☐ \$500,000 to \$1 million (1103)
 - ☐ \$250,000 to \$499,999 (1104)
 - ☐ \$100,000 to \$249,999 (1105)
 - ☐ \$26,000 to \$99,999 (1106)
 - ☐ Less than \$26,000 (1107)



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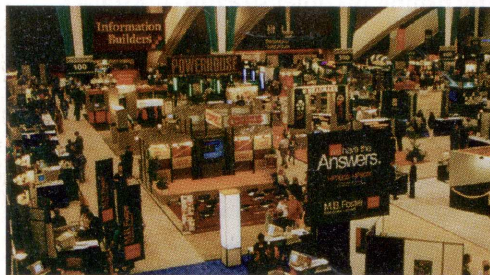
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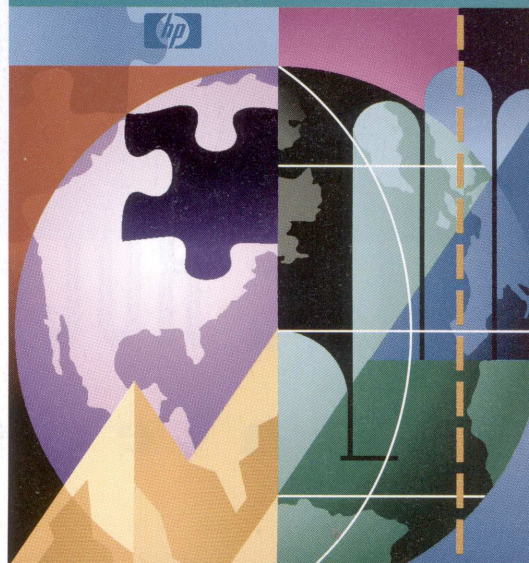
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Denver, the site of the Interex '94 Conference & Expo, September 18-22, is a mere 30 miles west of the Colorado Rockies—one of the world's most beautiful destinations. If you plan on spending a few days in the area before or after the conference, or even want to take a day trip, the Rocky Mountains can offer breathtaking scenery and ample opportunity for fishing, hiking, backpacking, camping, hang gliding, ballooning, white-water river running, horseback riding, mountain climbing, and skiing.

Denver is within an hour or so of a wide variety of outdoor adventures, and the Mile High Adventure Club makes them easily accessible. By calling (800) 489-4888, you can arrange day trips for fly fishing on quiet streams, horseback riding over old Indian trails, ballooning above the Front Range, mountain biking down the highest paved road in North America, river running through canyons, or even bungee jumping.

If you'd like to arrange your own excursion, the Rocky Mountain National Park is a good destination. Although it can become crowded on weekends, the park is the best place to become familiar

with the natural history and wildlife of the Rockies. Other destinations include Roosevelt, Arapaho, White River, San Isabel, and Pike National Forests, all of which are within a two-hour drive of Denver. Roosevelt borders Rocky Mountain National Park and offers camping and the popular Red Feather Lakes area. Arapaho borders the National Park on the south and contains the popular (and crowded) Indian Peaks Wilderness area. White River National Forest contains the skiing resorts Vail and Aspen. It is also home to two of the more spectacular mountain ranges, the Maroon Bells and Gore Range. San Isabel is "Fourteener" country, with a large grouping of 14,000-foot peaks, including the state's three highest mountains. And Pike National Forest offers famous Pikes Peak and miles of rolling foothills for easy hikes and camping.

Few spots in the world offer better opportunities for hiking, backpacking, camping, and mountain climbing than the Colorado Rockies. Unlike the Alps or even other parts of the Rockies, the Colorado mountains are fairly gentle,



offering hidden valleys, quiet streams, meadows of wildflowers, and peaceful lakes. Insects are seldom a

problem at high altitudes, and there are thousands of miles of well-marked trails. Almost all of Colorado's 14,000-foot peaks (of which there are 53) can be climbed by anyone in good shape and require no special climbing equipment. Throughout the state, there are more than 1,000 peaks more than two miles high, and it's easy to find beautiful overlooks and vistas no matter where you go.

Denver's nearby areas offer even more. River running day trips are available on the Colorado River through Glenwood Canyon and on the Arkansas River near Buena Vista. Many of these runs can be done in one-day trips from Denver, having you back in the city in time for a late dinner. The easy stretches offer exciting rapids, tranquil floats through canyons, and spectacular scenery. If you prefer sailing and boating, Grand Lake has the

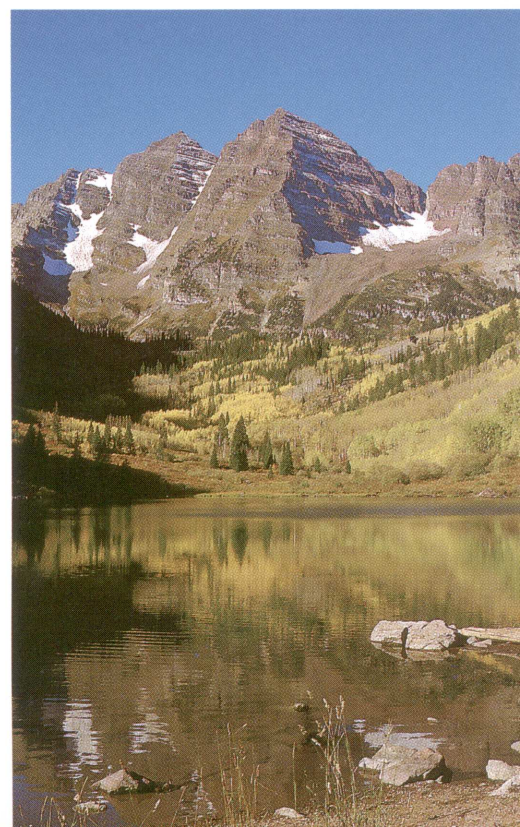
highest yacht club in the world, and offers the opportunity to sail through a canal to beautiful Shadow Mountain Reservoir. For boating regulations and information, write or call: Colorado Boating Safety Section, P.O. Box 231, Littleton, Colorado 80160, phone: (303) 791-1920.

In recent years, ballooning has become a very popular sport in Colorado. Private companies offer various packages allowing novices to soar into the sky overlooking miles of snow-capped peaks. There are currently balloon operators in Keystone, Steamboat Springs, and Snowmass.

For more information on these activities, contact the Denver Convention & Visitors Bureau, 225 West Colfax, Denver, Colorado 80202, phone: (303) 893-1112.

For more information on the Interex '94 Conference & Expo, contact the Interex conference department at (800) INTEREX or (408) 747-0227, fax: (408) 747-0947, e-mail: conference@interex.org.

See you in September!



by Larry Headlund

Xcoral

AS SOFTWARE CREATORS WE have several tools we use every working day. Compilers and/or interpreters are one example. I know I am frustrated if I don't have access to a debugger. When working in a team, a source code control system is a great comfort. GUI design and CASE tools are also common. Most of us also use make as part of every project. But the one tool we all probably spend the most time with is an editor. This intimate relationship is the source of the passionate feelings people have about particular editors. I have spent part of the last month in a promiscuous evaluation of new free X-based editors. Note I said X-based. From the topics I've covered in this column it seems a more appropriate name would have been "Motif Watch," but the editor I will discuss here is based on Xlib alone, not a higher level toolkit.

What Do We Want from an Editor?

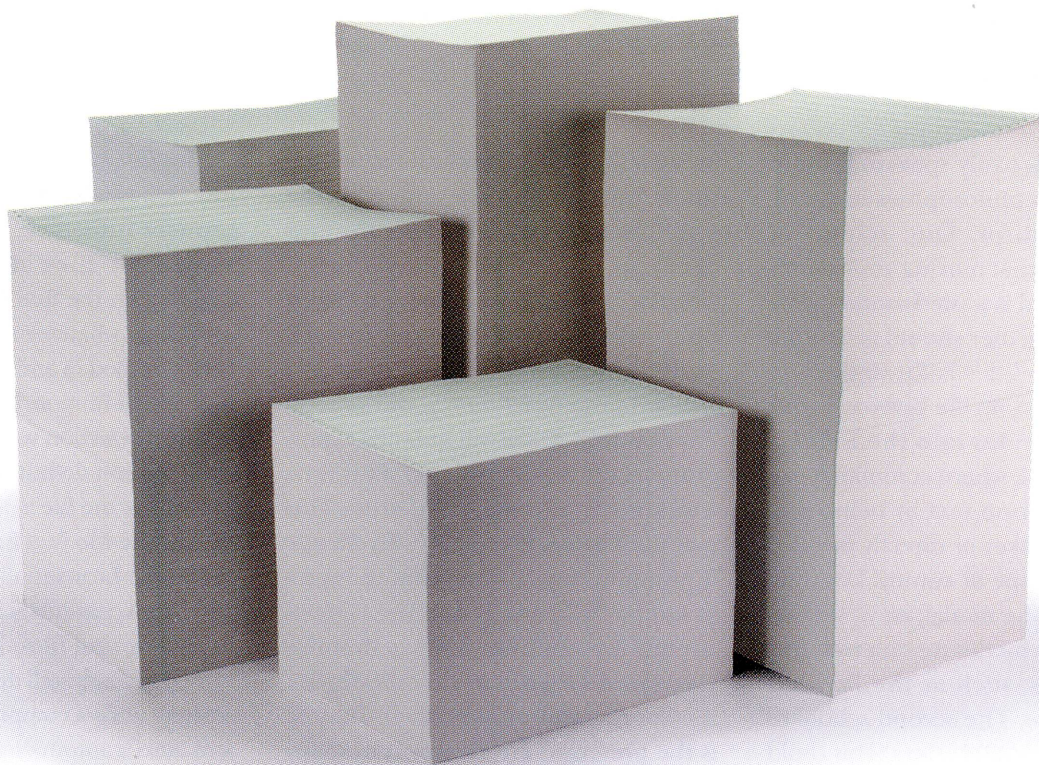
An editor has to work as part of your greater programming environment. Since few write perfect code the first time, this means accessing and using the results of make and your compiler. You don't write code in one big file, so the editor should help you find the piece of code you are looking for. You should have easy and effective access to your entire environment, including tools and programs about which the authors of the editor know nothing. The editor should help you in the formatting of your code, and let you decide which formatting style you prefer. And it should be customizable, so that your preferences are reflected in your environment. It is against this standard of perfection that I will measure editors.

Xcoral 2.1

Xcoral by Lionel Fournigault is a very interesting editor. All good editors have an embedded macro language for customization and user convenience. Much of EMACS' cult-like following and user enthusiasm can be traced to elisp, its Lisp-variant macro language. This language is so flexible that EMACS adherents can honestly say about just about any feature of any editor, "You can do that in EMACS!" Well, yes, but you do reach the point beyond exploiting features of an editor and into the ground of writing a new one. Rob Pike finesses this argument by pointing out that while you can do thus and so in EMACS, people don't. Basing a relative evaluation on practice instead of potential seems valid grounds.

That being said, *Xcoral* has an embedded macro language that is a C interpreter. This makes programming the macro very natural to C and C++ programmers. You don't have to shift mental gears going from development work to editor programming. The C interpreter can also be used as a stand-alone program. By the way, don't think that this C interpreter will be useful in prototyping your next CAD/CAM application. The C interpreter is called smac for SMall ANSI C interpreter. It only knows the types void, char, and int, and the derived types pointer and array. You cannot define struct or enum. There is no preprocessing as such—for example, you cannot #include files. You can use the supplied function load_file() to the same effect. The feel of writing smac programs is very Lisp-like. This is acknowledged by a Towers of Hanoi example program that is included.

The C interpreter is fundamental to



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using *Xcoral*. Broadly speaking, there are two design philosophies in a programmer's editor. One school of thought holds that moving your hands off the keyboard is wasted motion. The primary way the user should access the editor's capabilities is through commands entered from the keyboard. This philosophy divides into the EMACS modeless school, where commands are distinguished from text by being preceded by a metakey or directly invoked through an escape or control key combination, and the modal, or vi, school, which employs modes for entering text or commands, such as the familiar escape/i toggle. The second school of design agrees with Rob Pike: "This (hold left hand in contorted position as though simultaneously holding down a control key and pressing another key) is not the preferred position for a programmer's left hand. The preferred position of a programmer's left hand is holding the beverage of his or her choice while the right hand moves a mouse." *Xcoral* is solidly in the first, or keyboard, school and the modeless subgroup.

Much of the power of *Xcoral* can be accessed only through the command interpreter, without even a hint in the menus or buttons. This is reasonable if it is the editor within which you spend your life. It does mean you have to read the manual! An excellent manual in PostScript format is included in the distribution. Some of the menu buttons function more as online documentation, pointing to the correct metakey combination. This supplements the more formal online documentation. The advantage of this is that any functions you write yourself will seem on a par with the default functions.

Free software on the Internet tends to

be tools that the authors developed for their own use and presented to the world. This explains the preponderance of editors, GUI builders, system administration tools, and languages. When developing for your own use, you will integrate your own environment and style into the functionality of the tool. For example, *Xcoral* will indent a C program as the author of *Xcoral* prefers, which is the so-called GNU style. This may not be your preference. To change it, you would have to modify, to reprogram, the "C" mode using the C interpreter. Another example is that the hardcoded shell command calls *csh*, not the Bourne shell or Korn shell. The *csh* is the preferred environment of many UNIX aficionados, particularly those who were confirmed in the church of BSD. I prefer the Korn shell myself, but I try never to argue religion.

Xcoral is built on xlib (4X11), not using Motif or Athena. This has definite look-and-feel consequences. The windows and menus have the attractive three-dimensional look of Motif-based applications but do not behave like Motif widgets. The author has not taken the path of Tk or Interviews and presented Motif look-and-feel with a different underlying widget set. This is most noticeable when doing selects. The technique for selecting a range of text is not the familiar mouse drag nor is the selected region highlighted. The author prefers control key sequences to mark the beginning and end of a region and blinking cursors for demarcation.

The gold in the *Xcoral* program is in its integration with the C/C++ environment. It has a very efficient method of browsing functions by name, based on an internal parsing of the .c and .h files. For example, if you are in source

file *myfile.c* and see that it references a function *newfunc()*, you can pop up the browser interface, which has a split screen for files and function lists. Clicking on the function name opens a window in whatever source file the function is located in and positions you at the function definition. Clicking on another function selection very rapidly shows you that function definition. You can choose just to view the file in a read only window or edit the file in a full window. In C++ mode the browser allows you to search on classes, parents, children, methods, functions, and files. The compile/edit cycle is similarly well thought-out. You can arrange to do a compile inside the editor and have it automatically position you at line numbers that were flagged in the error output.

Making the program on HP machines is relatively simple. There is a makefile for HP-UX which has been tested on the 9000/720. The code will compile with the K&R cc compiler. In fact, the code is not ANSI C, but K&R style. When compiling on the HP 400 series, I had to make only a few changes in one file, *get_file.c*:

On line 67, `#include <a.out.h>` before `#include <filehdr.h>`

On line 604, change struct header head; to struct exec head;

On line 651, change `magic = head.a_magic;` to `magic = head.a_magic.file_type;`

These are obviously dependencies on the detail in the implementations of HP-UX on the two architectures.

Xcoral is released under a license of the author's own devising. It is not GNU, X type, or public domain. Essentially, the author permits noncommercial

copying and use but not distribution of modifications. For your personal use this should not present any problems. Any exceptional questions, of course, should be negotiated with the author.

If you choose to modify the source code, you will notice the comments are in French. This also explains why there is a French mode for entering text with accent marks. The included PostScript documentation is in English. ■

References:

Xcoral-2.1, Lionel Fournigault,
ftp.x.org:/contrib/Xcoral-
2.1.tar.Z.

"Acme: A User Interface for Programmers," Rob Pike,
Proceedings of the Winter 1994 USENIX Conference, ISBN 1-880446-58-8.

Larry Headlund is president of Eikonal Systems and has been working with commercial UNIX since 1982 and with X since 1988. He can be reached at (617) 482-3345 or lmh@world.std.com.

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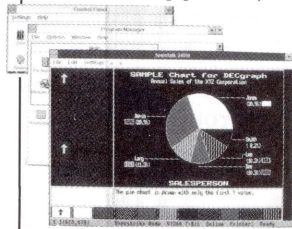
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CIRCLE 95 ON READER SERVICE CARD

by Bill Hassell

Toshiba 4101 Jumpers

A PROBLEM HAS BEEN discovered on the Toshiba 4101 CD-ROM. The drive is normally configured with jumpers set for SCSI ID-2, parity enabled, and one spare jumper. The problem is that the spare jumper may be placed across the wrong two pins thereby shorting the term power source (internal to drive) to ground. See *Figures 1* and *2* for the jumper positions.

Impact

The term power source in the drive consists of a polyswitch in series with a diode. The polyswitch is a self-resetting thermal switch that protects the drive and term power from inadvertent shorts. The polyswitch quickly warms up and increases its internal resistance significantly in a fault condition. Once tripped, the polyswitch will maintain a high resistance until the fault is removed and the polyswitch returns to ambient temperature.

Even with the spare jumper in the wrong position, there should be no negative impact on the drive operation. Testing with the 4101 throughout the last few months has revealed no problems or failures from this setting. This assumes the jumper being in place when the drive is powered on.

A bench experiment did show that if the spare jumper is not installed and then inserted (causing the term power short) while the drive is under power, the inrush current can cause the series diode to fail. This does *not* disable the drive, only the term power source, which is not used in Vectra system configurations. Again, this occurs only if the jumper is inserted under power.

CD-ROM Changer News

Pioneer's DRM-604X is a 6-CD-ROM

changer that's been around for more than a year and quietly holds the CD-ROM speed record: 4x or 400 percent faster than a standard CD-ROM drive. The drive is addressed as six separate subunits with one SCSI address on the bus, but currently only PC drivers seem to be available for it. In DOS/Windows, these discs appear as six different drive letter codes such as: J: K: L: M: N: O: and changing discs is as simple as typing the drive letter code in DOS. It has recently been reduced in price to about \$1,000, with dealer prices going even lower. Change time for loading a new disc is between 8 and 15 seconds.

The DRM-602X is a low-cost version of the DRM-604X, with a retail price under \$700. Compare this to the \$700 retail price of the Toshiba 3401 and this 6-CD-ROM changer is a best buy! It is half the speed of the 604X but only about twice the price of 2x speed CD-ROM single-disc drives.

On the other end of the spectrum is the DRM1804X; as you might guess from the model number, it holds 18 discs running at 4x normal speed. Suggested retail price is only \$2,000, which is very economical if you need more than four CD-ROM discs online. The typical \$350 price of a single 2x CD-ROM drive will set you back \$6,300 and requires three SCSI interfaces plus 18 power cables, etc.

At the very high end, Pinnacle Micro announced a jukebox that holds 100 CD-ROM discs or as much as 65 GB of information! It's called the Cascade CD 100 and uses a double-speed drive to read the discs. Change cycle time is about 6 seconds and with Pinnacle's Virtual File System software, access is provided either by volume or by file names. Pinnacle's new box works with both PCs and Macs, and supports CDROM-I, CDROM-XA, and PhotoCD formats.

FIGURE 1 4101 Jumper Block, *INCORRECTLY* Set

.	X	.	X	.	.	.	
	X		X				
.	X	.	X	.	XXXX		

<<< WRONG

^	^	^	^	^	^	^	^
J	J	J	J	B	J	J	J
1	2	3	4	L	5	6	7
				A			
				N			
				K			

J1 = SCSI ID1
 J2 = SCSI ID2
 J3 = SCSI ID4
 J4 = PARITY
 J5 = PRV/ALW
 J6 = TEST
 J7 = TERM POWER

XXXX = Jumper

FIGURE 2 4101 Jumper Block, *CORRECTLY* Set

.	X	.	X	.	.	.	
	X		X				
.	X	.	X	XXXX	.		

<<< RIGHT

^	^	^	^	^	^	^	^
J	J	J	J	B	J	J	J
1	2	3	4	L	5	6	7
				A			
				N			
				K			

J1 = SCSI ID1
 J2 = SCSI ID2
 J3 = SCSI ID4
 J4 = PARITY
 J5 = PRV/ALW
 J6 = TEST
 J7 = TERM POWER

XXXX = Jumper

Digizines?

Digital magazines (or digizines) are here! Rather than copying existing paper magazines to CD-ROM, *substance.digizine* is one of the first 100-percent digital magazines, with a goal of proving that multimedia CD-ROM offerings are no longer a fad but a new way of information distribution. The CD-ROM magazine subscription is only \$75 for four quarterly issues. The amount of information and its broad subject matter may make it one of the pioneers in this emerging field of electronic publications.

The first issue contains audio and video clips.

Sorting Printers in LaserROM

Many times a LaserROM server has multiple printers and the scroll box used in LaserROM can be a bit difficult to navigate. The *brom* program uses a script to list the printers; this script can be modified to sort the printer names. Change

the file *prnlist.gen* (in */usr/brom*) to read:

```
(LANG=C;export LANG;lpstat -v) |
awk -F: '{ print $1 }' | awk '{ print $3 }' |
sort | grep -v "^$"
```

The first line obtains a list of printers, making sure that the LANG variable is set to an expected value. The next line extracts just the printer name and skips the lines with remote system information. The last line sorts the printer names while removing blank lines.

Note: Because of the way *brom* executes the script, all three lines must appear on the same line. Using the escape character (\) does not work. In *vi*, use the J key to concatenate the lines. ■

Bill Hassell is a support engineer at the HP Response Center in Atlanta, Georgia.



CSL/HP-UX

ONE OF MY PET PEEVES working in the information systems business is the ease with which most of us can get caught up in "market speak." I can remember hearing terms like "open systems," "standards," "fault-tolerant," and "real-time" being used in ways that frankly I just could not recognize. It's not the use of the terms that is so troubling, but the misuse when the meanings are stretched beyond recognition and devalued by some vendors to the point that they become meaningless. It's sort of what happens to a used car when you trade it in. A little paint, shine the chrome, clean the engine block, and presto, just like new. And by the way, it's no longer a "used car," it's been transformed into a "pre-enjoyed vehicle."

So what's the hottest term now? Come on, you know it. Introducing the information super-highway. Everywhere you look, even in your local newspapers, it's the absolute rage. All hyped up and ready to transform every aspect of our lives from how we shop to what we consider entertainment. Some would have you believe that it is already here, ready to plug into. It's just not so. Heck, we don't even have a common definition yet. Who's going to build it and how much will it cost? Is it being overly hyped to the point of being a meaningless term? My advice is to sit tight and keep abreast of the developments but be real critical of what you hear; we are just beginning and there is a long way to go.

I like to think of it more as a trail. I

TABLE 1 *CSL/HP-UX Release 3419*

NAME	TITLE
imake-5.03	imake utility for hp-ux
Xaw-5.00	X11R5/HP-UX 9.0 Athena Widgets
psort	Process Table sort command
porting_tips	Porting tips for HP-UX
puzzles	Motif/X11 Puzzle Games
zsh-2.3.1	The 'Z' shell
how_full	Determines capacity in an Allbase environment
mpeg_encode-1.1	Movie Image Encoder
mpeg_play-2.0	Movie Image Viewer
ghostview-1.5	Ghostscript (Postscript) Previewer
ghostscript-2.6.1	Ghostscript Text Processor
R_CLIENT	Provide BSD IPC client-server pair
pbmplus	Portable Bitmap Filters (10dec91)
zmodem	XMODEM/YMODEM/ZMODEM Transfer Programs
xmessage	Display text messages in X-window
xgetftp-2.0	X/Motif Version of ftp
llnlxftp	LLNL xftp for Motif 1.2
usenet-docs	Usenet (network News) Documents
faq	Frequently Asked Questions
sockets-examples	MPE/ix sockets examples
xmailtool-2.1.1d	X11/Motif Mailtool (à la SUN Mailtool)
less	'more' with backward scrolling

Continued

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TABLE 1 *CSL/HP-UX Release 3419, continued*

top-3.2	Display CPU status by program
p2c-1.16	Pascal to C Translator
perl-4.36	Perl language and utilities
perl_refguide	Perl Reference Guide (4.36)
elm.2.4.23	The Elm Mailer - Network Version 2.4
gzip-1.24	GNU zipper/unzipper
X11R5-fixes	Latest Fix files for X11R5 (fix24-26)
mrolo	Motif Based Rolodex
mm-2.7	Metamail (MIME compliant mail processor)
plan.1.2	Calendar Management
xmcd-1.1	Motif CD player front end
twotimer	Tendonitis healing aid
x3270-3.0.1	BM 3270 Terminal Emulator for X
unzip51	ZIP/UNZIP, File archive/compression
xpostit-3.3.1	X-Window "Postit Note"
xloadimage-4.1	Display various image types in X-windows
traceroute	trace routing of TCP/IP packets
gnuemacs-19.22	GNU Emacs Editor
gcc_built-2.4.5	GCC built for Series 700
gcc-2.4.5	GNU C/C++ Compiler
libg++-2.4	GNU G++ libraries
sudo.v1.3	su(1) command with Logging/authorization
Mosaic-2.4	NCSA Mosaic World-Wide-Web Browser
hdf3.3r3	Hierarchical Data Format Library
xrn6-17	X11/Motif Based Usenet Reader
rn.4.4.3	Terminal Based Usenet News reader
acm-4.4	Aerial Combat Simulator for X11
gnuchess-4.0.69	GNU Chess
xboard-3.0.09	X11 Interface for GNU Chess
tcl-7.3	Tool Command Language
tk-3.6.1	A Motif Toolkit implemented with Tcl

TABLE 2 *HP-UX CSL and Swap Library Output*

CSL RELEASE	NUMBER OF CONTRIBUTIONS	NUMBER OF CONTRIBUTORS	SIZE IN MEGABYTES
2934 (1989)	98	44	18.9
3046 (1990)	44	22	5.6
3110 (1991)	38	15	191.8
3217 (1992)	47	20	81.9
3321 (1993)	53	14	55.2
3419 (1994)	53	8	113.3

hoist on my backpack, get out the topographical map and my compass, and head out exploring. Oh, and I wear a really good pair of boots and take rain-wear in case I encounter bad weather. I'll take my camera (loaded with my favorite film), to capture those particularly beautiful views and bring them back to share with family and friends. Sounds pretty enchanting, doesn't it? Here, let me tell you about some of the "great views."

One of the newest gadgets in the world of information is known as the World Wide Web. The WWW project, started by CERN (the European Laboratory for Particle Physics), seeks to build a distributed hypermedia system. Hypermedia, or hypertext, has some distinct advantages in that the user can access information in a more intuitive style, by just "clicking" on a reference to it. The front end to the Web is known as a browser. A good example is called Mosaic, supplied by the National Center for Super-computer Applications at the University of Illinois. There are versions for most of the UNIX platforms, Windows, and the Macintosh. At the back-end are information resources that can be accessed in a variety of ways, including ftp, a new protocol called http, existing distributed information systems such as gopher or WAIS, and even telnet connections.

On this year's release of the CSL, you will find the Mosaic software along with some documentation about the Web in the Frequently Asked Questions contribution. Interex is planning to put together more electronic resources for our members, and having Mosaic available is a first step. There will be more pieces of the Web forthcoming in future releases, including the Denver Swap

tape. Why not consider contributing some of your work to the CSL? Bring it to the Denver conference and you'll be able to go home with more than you came with.

The 1994 release of the Interex CSL is out. The release is jam-packed with useful software and information. Our goal with this release was to bring you some of the newer programs accessible to many Internet users. We also wanted to bring some basic technologies such as the GNU C compiler and Pascal to C converters. Many of you are in the midst of migrating to HP-UX and may not believe that this environment is as functional as you would like. We hope that through this release (and some of the previous contributions) you will find what you need to ensure your success.

I'll see you on the information trail. Bring your water bottle and survival kit and don't forget the camera!

The Index for the 3419 release, as well as some statistics about the six releases of the library, appear in *Tables 1 and 2*. □

Paul Gerwitz is chairman of the CSL/HP-UX committee and is a technology specialist at Eastman Kodak Company in Rochester NY. He can be reached at 716-477-3067 or e-mail at gerwitz@interex.org or gerwitz@kodak.com.

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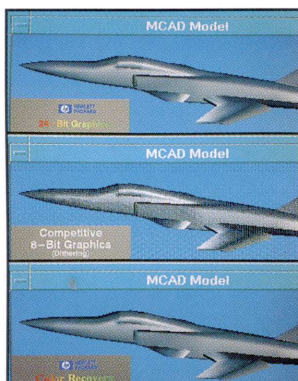
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Graphics Workstations



**HP 9000 Series 700 Model 715,
EDS Unigraphics**

IN JANUARY 1994, HP announced the HP 9000 Model 712 low-end workstation. In March, the company announced the Models 735 and 755 at the high end of its workstation line. Now, HP is going for the "sweet spot" in the market—the growing technical workstation segment.

The new versions of the Models 715 and 725 are intended to "fill in the remaining missing puzzle piece of our product line," said Conny Gaus, program manager for HP's workstations. These models are the industry's fastest graphics workstations available under \$20,000. Although midrange in price, these workstations are faster than most others at any price.

These new workstations are HP's first implementation of the PA-7100LC to run at 100 MHz. This microprocessor can allow the realistic display of an interactive video-conference for as many as six participants. The chip can decode MPEG-1 video (352

x 240 resolution) at 30 frames per second while simultaneously decoding stereo audio (16-bit sampling at 44.1 MHz). The 7100LC chip was first implemented in the Model 712 at 60 MHz and 80 MHz earlier this year.

The new products include the Model 715, which offers one EISA slot and runs at clock speeds of 64 MHz, 80 MHz, and 100 MHz, and the Model 725, which offers four EISA slots and runs at 100 MHz.

HP also announced the new HCRX-8, HCRX-24, HCRX-8Z, and HCRX-24Z graphics subsystems.

The Right System

By adding these new products to its workstation lineup, HP intends "to give

our customers flexibility, the right system, and the right expandability with the right price," said Gaus. HP is positioning the new models at specific sets of tasks within multimedia and design applications. The Model 715/64, which performs at 67 SPECint92 and 97 SPECfp92, is positioned as a good entry-level 3-D system and multimedia creation workstation. "You would use it where you need excellent graphics performance, but you wouldn't use that for heads-down design," said Gaus.

"Heads-down" design, or intensive, day-long design work such as solids modeling, is better performed with the 715 80-MHz (84 SPECint92 and 121 SPECfp92) or 715 100-MHz (100 SPECint92 and 137 SPECfp92) implementations.

The 715s support up to 256 MB of memory capacity and 256 KB of combined instruction and data cache, while the 725 supports up to 512 MB of memory. The 725s added memory, file, and compute capacity allow it to be used as an X station server, Gaus suggested.

The performance of these midrange workstations exceeds the performance found in many competing workstations. The Model 715/100 delivers 33-percent faster SPECfp92 than the SPARCstation 20/61, Sun's highest-performing uniprocessor desktop system, and boasts 44-percent higher integer performance than IBM's highest-performing desktop system, the IBM 375 (37T). It also provides almost twice the performance of Silicon Graphics' new Indy R4600.

HP also scored well in the industry-standard Picture Level Benchmark (PLB), which combines the ratings of compute power and graphics subsystems as an integrated unit. The 715/100's PLBsurf93 ratings exceeded even those

achieved by the Alpha 800, in spite of the Alpha's compute power. In addition, SGI's highest-end workstation, the Indigo2 R440 Extreme, falls short on all CPU and graphics measurements but one (lighted/shaded quads per second) when compared to the 715/100.

A couple of features contribute to HP's success—HP's 7100LC low-cost chip design provides for parallel subword Arithmetic and integrated graphics. Parallel Subword Arithmetic makes creative use of the 7100LC's two integer units, both of which can process instructions for the typical 32-bit RISC data path. When applications that do not require the full 32 bits are run, the integer data path splits into two 16-bit sections, or "subwords"—one section for each integer unit, with each integer unit processing instructions simultaneously. Gaus said that multimedia applications really benefit from Parallel Subword Arithmetic and that HP sees providing this capability as "future-proofing architecture to accommodate increasingly popular multimedia".

Multimedia applications also benefit from on-chip MPEG compression/decompression. All 80-MHz class machines provide a rate of more than 30 frames per second (fps), or full-display quality. Among Sun, SGI, DEC, Pentium, and 486 PC desktops, HP offers the only workstations with such capability. (According to HP sources, DEC's Alpha 275 is supposed to achieve 29.8 fps, but it hadn't yet shipped at press time.)

Another capability integrated on the chip is HP Color Recovery, which allows the simultaneous display of approximately 4.8 million colors instead of the usual 256 colors on an 8-plane system. "That is unique in the industry," Gaus said. Typically, she explained, the extensive

color palette is available only with more expensive 24-plane systems—users are said to have had to employ dithering, or blending of pixels, to create millions of colors on an 8-plane system.

New Graphics Subsystems

Graphics capabilities are increased further with new graphic accelerators, the HCRX line. These subsystems deliver the industry's fastest X Window acceleration on the desktop and offer 3-D solids modeling performance formerly available only at the \$50,000 price point. They are also double-buffered and offer eight overlay planes for increased GUI performance and smooth movement of dynamic images.

HCRX-8 delivers fast X Window and 2-D vector performance on the desktop as well as fast 3-D vector and wireframe performance. HCRX-24 offers that same performance and will display up to 16.7 million colors simultaneously when users require full 24-bit visual imaging quality.

For users who need to render 3-D solids, the HCRX-8Z and HCRX-24Z are said to provide the best price/performance 3-D renderer in the industry. These systems provide advanced features such as alpha transparency, deformation animation, texture mapping, and anti-aliased vectors.

The 715 and 725 support up to 4 GB of internal total disk capacity and feature a 17- or 20-inch color monitor. The workstations feature plug-in memory modules, disks, and removable media devices that include an industry-standard 3.5-inch floppy disk. The systems have built-in IEEE 802.3 local area networking, an external SCSI-2 port, a Centronics interface, two RS-232 serial ports, audio connections, HIL, and PS/2

for multiple input-device support.

The new workstations require the HP-UX 9.05 operating system, which is object-code-compatible with HP-UX 9.03 and includes PEX 5.1 runtime, the industry-standard 3-D graphics API.

No-Penalty Upgrades

In most cases, upgrades to the new workstations and graphics subsystems are "no penalty," in that users pay only the difference in cost between their current system and the new system. Gaus commented, "HP has had a good track record in providing a good growth path. We believe it's vital." As such, HP maintains full binary compatibility with existing systems and graphics. Board upgrades are available for current 715 users; system trade-ins are available for 712 users.

HP will offer a 100-MHz board upgrade to users of the Model 725/50 and 725/75 later this year.

The Model 715s are available now; the Model 725 is scheduled for availability in the third quarter of 1994. Prices for Model 715s with 32 MB of RAM, a 17-inch color monitor, and 525 MB of hard disk are as follows: Model 715/64, \$9,995; Model 715/80, \$13,600; and Model 715/100, \$19,005. Prices had not been set for Model 725s at press time.

The graphics accelerator cards are available and priced as follows: HCRX-8, \$2,500; HCRX-24, \$4,000; HCRX-8Z, \$5,500; and HCRX-24Z, \$7,000.

HP computers come standard with a limited, one-year, on-site warranty and a choice of support options. ■

Michelle Pollace is the New Products editor for hp-ux/usr.



New Products

SCSI Switch

Applied Concepts has announced the SCSI Switch, model ACI-2014, a 4 x 2 electronic crosspoint switch that offers both local and remote switching of multiple SCSI computer and peripheral buses. This new fast SCSI-compatible switch supports standard 8-bit and 16-bit (wide) SCSI devices and enables disks, imaging cameras, page scanners, RAID arrays, tape backup systems, and CD-ROMs on six independent SCSI buses to be connected and exchanged electronically. The SCSI Switch is supplied with Windows, Macintosh, and

UNIX software to control selection via a standard RS-232 computer port. SCSI peripherals now can be shared easily between different computers without reconfiguring cables or bus terminators. Up to four SCSI Switches can be controlled from one

RS-232 interface. The front panel indicators identify selected SCSI ports and bus activity.

SCSI Switch circuitry extends SCSI cable distances between computers and peripherals up to 12 meters (40 feet). Internal "active" terminators are controlled by a rear panel switch. SCSI Switch does not require a device ID and is said to be completely transparent to all computers and peripherals on the bus. No additional software is required.

The SCSI Switch supports Fast SCSI (10 MB/second) computers and peripherals in asynchronous and synchronous mode. The SCSI Switch conforms to ANSI X3.131 and X3T9.2 specifications for single-ended devices. Disconnect and reselect functions are fully supported to ensure complete SCSI compatibility. The SCSI Switch supports U.S. and international input power voltages from 105 to 240 VAC.

Model ACI-2014ASN supports 50-pin Centronics cables and lists for \$1,295, and model ACI-2014CSN uses 50-pin high-density SCSI-2 connectors and lists for \$1,395. The SCSI Switch model ACI-2014CSW supports 68-pin wide SCSI-2 and SCSI-3 devices and retails for \$1,995.

Contact Applied Concepts, Inc., 9130 SW Pioneer Court, Wilsonville, Oregon 97070, phone: (503) 685-9300, fax: (503) 685-9099.

Client-Server Business Applications

Collier-Jackson has announced VisionShift client-server applications for HP 9000 Series 800 business servers. These products will include enterprise-wide accounting, human resources, payroll, and line-of-business distribution.

VisionShift leverages Collier-Jackson's experience with Microsoft Access, Microsoft Visual Basic Applications Edition, and Microsoft Office. Fully integrated business applications are designed to work together on the desktop with the ease of use and flexibility of Microsoft Windows, Word, Excel, and Mail.

VisionShift Accounting includes General Ledger, Accounts Payable, and Accounts Receivable. The account generation process is designed to automatically build the general ledger structure that fits a user's exact business



**SCSI Switch, Model
ACI-2014**

NOW THERE'S A NETWORKED SYSTEMS MANAGEMENT SOLUTION FOR UNIX THAT WASN'T BORN YESTERDAY

UNIX as a commercial data processing environment is still in its infancy. But that doesn't mean you have to settle for UNIX systems management tools that aren't grown up.

Unison-Tymlabs is pleased to announce Maestro for UNIX, the first full-featured batch job scheduling and workload management solution for UNIX systems. Maestro has been solving batch job management problems in demanding HP 3000 commercial environments since 1986, and is currently installed on thousands of systems worldwide.

Maestro for UNIX enables systems managers or administrators to automate network job scheduling, tracking, and monitoring to increase throughput and reduce processing errors. It can schedule jobs anywhere on your network according to customized business calendars, in addition to date, day of the week, and time.

You can make job initiation dependent on the successful completion of other jobs, the existence of needed files, user response to a prompt, or the availability of hardware or data resources. The Maestro master console on the server provides a single interface for all monitoring and control.

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needs, in both single- and multiple-company environments.

VisionShift Human Resources is intended to improve analysis and decision making on employees and applicants, help in performance evaluations, and facilitate regulatory compliance. The payroll application provides a system to handle any pay cycle, unlimited deductions, and complex withholdings and accruals.

The product is intended to provide users in mainframe-alternative and client-server environments with best-in-class business applications optimized for UNIX, Microsoft Windows NT, and SQL Server.

Collier-Jackson is a Hewlett-Packard Premiere Solution Partner.

Contact Collier-Jackson at phone: (813) 878-7867, fax: (813) 876-8786.

Client-Server COBOL

Acucobol, Inc. has announced AcuServer, a client-server file system for ACUCOBOL-85 applications running in UNIX TCP/IP networks. The initial version, which supports UNIX clients and UNIX servers, was planned for release in 1994. A future release will add support for DOS clients.

AcuServer is designed to enable applications to create and store data files on any network system equipped with AcuServer. Users can place data files on one computer and access them from any other computer on the network. Full-function remote access to all Vision, relative, and sequential files also is achieved, as is complete record-locking support of Vision and relative files. In addition, AcuServer provides transparent access to remote and local files. Developers can implement, test, and deliver client-server products quickly, the company notes.

Color Videoconferencing

InSoft, Inc. has announced Communique!'s support of Parallax Graphic's PowerVideo700 videoboard for HP 9000 Series 700 workstations. Fully integrated InSoft ConferenceKits, which include Communique!, the Parallax PowerVideo700 videoboard, camera, and microphone, were scheduled to be available from InSoft in May.

Based on InSoft OpenDVE (Digital Video Everywhere) software, Communique! for HP 9000s conferences to all supported InSoft platforms, across local-area networks (TCP/IP, Ethernet, ATM, and FDDI), and wide-area networks (Frame-Relay, ISDN, and SMDS).

Communique! integrates real-time digital video with interactive, point-and-click tools such as a shared whiteboard, shared writeboard, and audio, text, and graphics tools. With full-motion color video, users can work with more than one location at one time.

InSoft also plans to port InSoft Network Television! (INTV!) to the PowerVideo700 Series videoboards. INTV! allows digital video distribution across the network to users on an "on-demand" basis. Any workstation or server can be configured with standard television cabling as a non-dedicated "TV station," and the administrator has complete control in regard to each user's frame rate and video window size. The frame overlay video card supports 24-bit color and demonstrates up to a full-screen display of digital video. It includes two composite RCA video input ports and JPEG compression and decompression.

The PowerVideo700 Series uses Parallax's VideoStream to support simultaneous video windows and fast frame rates for performance-intensive applications like desktop video conferencing and video-on-demand.

Contact InSoft, Inc., Executive Park West One, Suite 307, 4718 Old Gettysburg Road, Mechanicsburg, Pennsylvania 17055, phone: (717) 730-9501, fax: (717) 730-9504; e-mail: kdw@insoft.com.

Use of AcuServer does not require that any changes be made to the existing application code, providing the data file pathnames are not hard-coded. Pathnames to remote files can be defined in the runtime configuration file or the operating system environment rather than in the application code. Existing programs do not need to be recompiled. According to the company, Runtime Version 2.3 and AcuServer give instant remote file access capabilities to programs compiled with any version of any Acucobol compiler.

Contact Acucobol, Inc., 7950

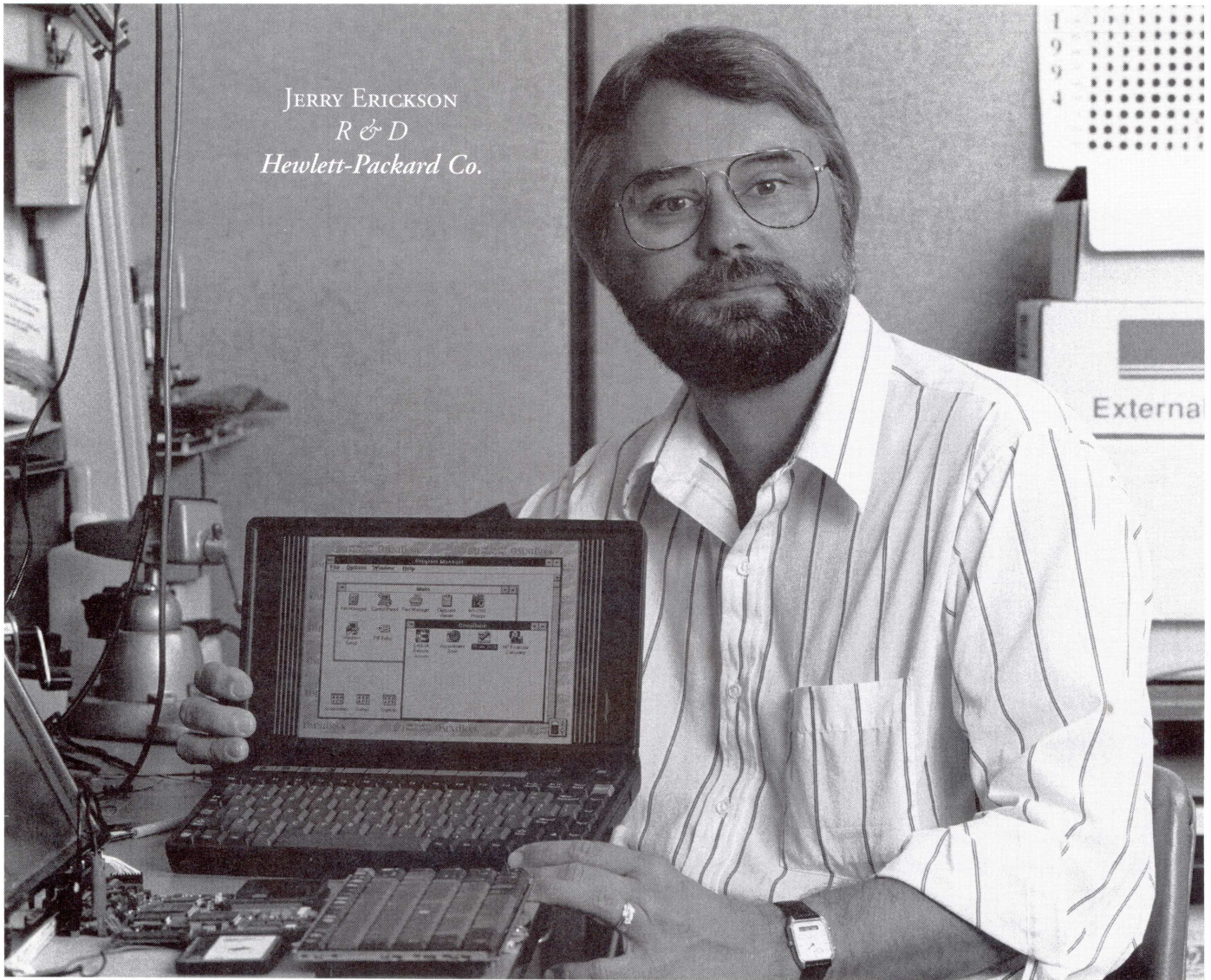
Silverton Avenue, Suite 201, San Diego, California 92126, phone: (619) 689-7220 or (800) 262-6585, fax: (619) 566-3071.

PC-to-UNIX Connectivity

WRQ has announced Reflection X Version 4.1, which gives users the option of installing the Reflection Network Series for Windows, an integrated TCP/IP stack consisting of virtual device drivers (VxDs) and dynamic link libraries (DLLs).

The bundled product, called the Reflection X Connectivity Suite, offers an FTP client and server, LPD/LPR,

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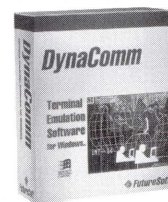
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New from SEEK Systems

Caching Controller

SEEK Systems has announced Xcelerator, a caching controller said to provide up to 2,000 I/Os per second. The Xcelerator attaches to any standard SCSI bus and allows for maximum processing in-cache, as opposed to having to mechanically access the disk. Processing in-cache eliminates both seek and latency times.

The Xcelerator has 12 wide or standard SCSI channels, allowing for the attachment of 176 physical devices with up to 1 GB of cache. It can be configured with or without RAID. RAID levels 3, 4, and 5 are supported.

SEEK Systems' caching RAID system, the SEEK-ARRAY, incorporates standard RAID features and is said to provide superior performance through WriteBack Cache, command queuing, and write reordering. The SEEK-ARRAY connects to any generic SCSI host and is integrated easily into a variety of platforms, including HP 9000s.

Xcelerator without RAID starts at \$9,950.

RAID Optimization

SEEK Systems has announced an advanced modeling tool that examines I/O activity to determine the optimum RAID level for a specific environment. The SEEK I/O ANALYZER 6000 is designed to determine for specific computing environments the proper type of cache (read-only, write-through, or write-back) and the proper cache size for peak performance. The SEEK I/O ANALYZER 6000 examines an I/O trace of a system to provide information such as the percentage of reads vs. writes, average I/O operation size, and estimated hit ratios for various types of cache.

Contact SEEK Systems, 11014 120th Avenue NE, Kirkland, Washington 98033, phone: (206) 822-7400, fax: (206) 822-3898.

SNMP, Finger, troubleshooting utilities (event log, trace, statistics), PING, and CSLIP. It supports Windows Sockets 1.1.

Reflection X also is available as a stand-alone product for use with third-party TCP/IP stacks. Version 4.1 offers increased network support, advanced window management, and enhanced performance. New features include DECnet support; configurable window panning in both single- and multi-

window modes; a "fit window to display" option; easier client launching; new password security features; 24-bit color support, giving PCs support for 16 million colors; faster performance over the network; and backing store in multiple-window mode.

Version 4.1 of Reflection X will ship in June and will run over all major third-party TCP stacks. It also supports the WinSock specification. Single-copy retail

price is \$469, and trade-ups to Reflection X for PCX server users is \$100. Earlier versions of Reflection X or any competitor's product are eligible for the special trade-in pricing.

Single-copy retail price of the Reflection X Connectivity Suite is \$599. Update or competitor's trade-in pricing for the Reflection X Connectivity Suite is \$200.

Contact WRQ, 1500 Dexter Avenue North, Seattle, Washington 98109, phone: (800) 872-2829 or (206) 217-7100.

Windows Development on UNIX

MainSoft Corporation has signed a license agreement with Microsoft for the Windows libraries for UNIX. Under the terms of this multi-year agreement, MainSoft can incorporate source code for current and future Windows technology into its MainWin Cross-Development Kit.

The agreement is intended to ensure that all applications ported with the MainWin Cross-Development Kit will be fully compatible with current versions of Windows and that future versions of Windows will be available for UNIX workstations.

The MainWin Cross-Development Kit enables software developers to separate applications from the target computing platform, in effect creating a "universal API" based on the most widely used development environment.

The MainWin technology is an implementation of the Windows API directly on UNIX. Instead of emulating Windows, which adds layers of code and slows performance, MainWin sits directly on Xlib and the UNIX operating system, resulting in faster computing speeds. Performance of all applications ported to UNIX with the MainWin technology

is said to be equal to or greater than applications written directly for the Motif API. End users of MainWin-ported applications can specify whether the applications have the Windows or Motif look.

The MainWin Cross-Development Kit offers tools for software developers to move applications written in C or C++ for Windows to any of the major UNIX/X Windows workstations, including those from HP.

Contact MainSoft Corporation, 883 North Shoreline Blvd., Suite C-100, Mountain View, California 94043, phone: (415) 966-0600, fax: (415) 966-0613.

Open Manufacturing Software

Andersen Consulting has announced MAC-PAC OPEN, an integrated manufacturing, distribution, and financial software system, for HP 9000s and other UNIX platforms running Oracle, Informix, or Sybase databases. MAC-PAC OPEN is scheduled to be available second quarter 1994.

MAC-PAC OPEN is based on Andersen Consulting's MACH-II (Machine Independent Interface) execution architecture. MACH-II is a nonproprietary, advanced, online processing architecture developed to take advantage of the flexibility and power of UNIX, as well as offer the ease of moving across platforms and databases. Embracing a client-server computing environment, the software is written in C and C++ and conforms to ANSI C and ANSI SQL standards. In addition to the flexibility offered by the wide range of platforms, MAC-PAC OPEN provides users with a GUI for added ease of use.

Whether the manufacturer is discrete, JIT/repetitive, made-to-order, job shop, batch process, or a hybrid, MAC-PAC OPEN is designed to help manufacturers better control their enterprise-wide

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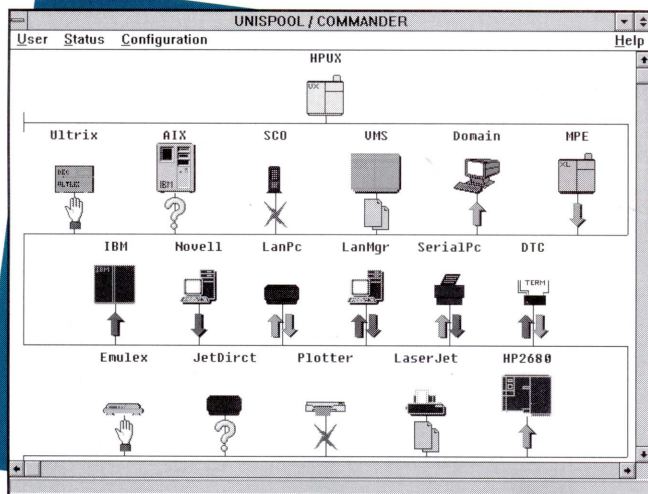


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new products

operations in a client-server environment. The software integrates the flow of information from one process to another, one department to another, and one site to another. It operates in a wide range of languages and currencies for global businesses.

Contact Andersen Consulting, 69 West Washington Street, Chicago, Illinois 60602, phone: (800) 541-7512 or (312) 507-6588.

Regression Testing

Performance Awareness has announced preVue-X, an entry-level regression testing tool that allows one tester to emulate a single application user. This new license provides basic application regression testing for \$14,975.

Users who purchase the entry-level tool

can upgrade their license to increase the number of users emulated simultaneously on a single CPU. The entry-level tool includes one free training seat and the standard documentation. Maintenance and support contracts are optional.

Performance Awareness offers a complete suite of regression testing, performance measurement, and stress load testing tools. These software solutions offer a common methodology and feature set for all aspects of product testing.

Contact Performance Awareness, 8521 Six Forks Road, Suite 200, Raleigh, North Carolina 27615, phone: (919) 870-8800, fax: (919) 870-7416.

Service Application

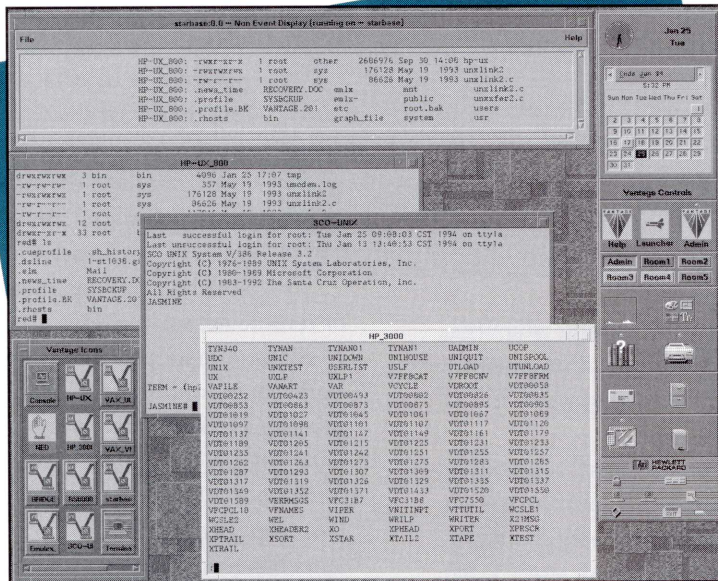
Metrix, Inc. has announced Open-UPTIME Release 3.0, which encompasses

its Support Desk, Field Service, and Repair Center modules. This release features the new Repair Center, new functions including task-based contracts, and an interactive schedule board.

Metrix' new Guaranteed Maximum (G-Max) contract allows a specific amount of service to be performed up until a specified end date. Open-UPTIME is also premiering task-based contracts, which allow customers to define specific tasks to be performed within a preventive maintenance visit or an installation project.

Metrix has further developed its Schedule Board to permit replanning of an assignment and to re-page an engineer based on availability and proposed task length. It provides online inquiry of the entire service schedule including

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new products

call status, priority, location of engineer by day, week, and month, and a copy of open service calls. The Schedule Board was designed as an interactive profile of each engineer's service calendar. Point-and-click re-assignment to another engineer is provided.

The application now provides a personal schedule board for each engineer, allowing an engineer to quickly modify the service schedule either at headquarters or in the field. OpenUPTIME also provides a new manpower estimation screen.

Metrix has added new reports to OpenUPTIME and enhanced the OpenUPTIME Open Call Monitor, which provides a layout of all open calls highlighted to denote priority and escalation status. Metrix also has added

numerous security functions, including the ability to restrict data access on a geographic location.

OpenUPTIME is written in the Uniface 4GL to support multiple platforms, relational databases, and graphical user interfaces. Hardware platforms supported by OpenUPTIME include HP.

Contact Metrix, Inc., 20975 Swenson Drive, Waukesha, Wisconsin 53186-4064, phone: (414) 798-8560, fax: (414) 798-8573.

Cross-Platform Automation

I-Kinetics, Inc. has introduced the new Command Adapter for its I-Bridge communications framework. The I-Bridge Command Adapter enables cross-platform automation between Windows and UNIX applications. The Command

Adapter accepts requests from the Windows client in the form of an I-Bridge Agent. It also can control the execution of a UNIX program and then transport the output to a Windows application, optionally filtering and formatting it. The Windows user can continue to work with the Windows application while the Agent executes.

The Command Adapter joins a suite of SQL Adapters for Ingres, Oracle, and Sybase. An I-Bridge Agent uses those Adapters to execute SQL on a database server and deliver the results back to the Windows application.

I-Bridge Agents are designed to provide extra control for Windows/UNIX cross-platform workflow automation. New Windows-based compound applications can be dynamically assembled

ASTA QA C

Source Code Analyzer

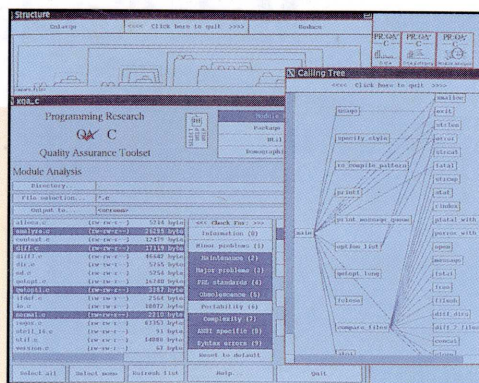
ASTA, Inc. has announced QA C for improving the portability, maintainability, and reliability of C source code. Users can analyze C source code and check for over 800 different types of potential problems including deviation from ANSI or company-specified programming standards, use of non-portable coding practices, and incompatibilities with C++. QA C also produces a variety of reports that describe and rank potential problems, highlighting the function and line in which the problem was detected.

It provides an automated mechanism for documenting and controlling the quality of source code. In addition, QA C calculates and reports on more than 40 different metrics, including well-known industry standards such as Cyclomatic complexity (McCabe), Myer's Interval, static path count, actual and predicted (Halstead, Zipf) token count, and number of lines, functions, and externals.

Users can make comparisons of the quality of their source code from one release to the next or compare the relative quality of their code with samples from industry. Graphical reports such as calling trees and control structures also are provided. Code checking functions can be added, turned on, or turned off. Warning messages can be modified, and reports can be customized. In addition to access through an X Window interface, QA C offers a command-line interface.

QA C is available on all HP 9000s and other UNIX platforms. License prices start at \$9,200.

Contact ASTA, Inc., 1 Chestnut Street, Suites 205/206, Nashua, New Hampshire 03060, phone: (603) 889-2230, fax: (603) 881-3740.



well-defined Application Programmer's Interface (API) to help integrate third-party back-up solutions, will allow use of multiple tape drives simultaneously for backing up online databases. Tape drives and libraries may be accessed on local or remote network systems.

Alexandria supports a variety of UNIX workstations and file servers and accommodates a variety of automated media handling systems. HP 9000s and other systems are supported as both clients and servers. Developed specifically for use with autochangers, Alexandria can back up to tape libraries from Spectra Logic, Exabyte, and ADIC, as well as HP Optical Jukeboxes.

The Alexandria Backup Librarian is designed to supervise every facet of backup from automatically starting scheduled store operations to managing data, media, storage devices, and device maintenance across an entire network. The OBACKUP will allow Alexandria to seamlessly integrate database backups with UNIX filesystem backups.

Spectra Logic's OBACKUP Personality for Alexandria is available for \$1,500 to \$9,000, depending on the size of the host system.

Contact Spectra Logic 1700 North 55th Street, Boulder, Colorado 80301, phone: (303) 449-7759, fax: (303) 939-8844, e-mail: alexandria@spectra.wali.com.

Four-Way Splitter

RGB Spectrum has announced a four-way splitter for workstations used in simulation and virtual reality applications. In a standard configuration, each screen on a simulator requires input from a separate computer or visual display generator. With the four-way splitter, a single computer can feed the visual display

from the variety of applications and services hosted on an enterprise's UNIX servers. For instance, a Windows spreadsheet can launch multiple agents, directly accessing UNIX data warehouses, statistical analysis programs, process monitoring, data feeds, and proprietary accounting programs and databases.

The Command Adapter is available for HP-UX and other UNIX platforms. A Starter Kit containing the Command Adapter and two Windows Excel clients is available for \$995.

Contact I-Kinetics, 19 Bishop Allen Drive, Cambridge, Massachusetts 02139, phone: (617) 661-8181, fax: (617) 661-8625; e-mail: ahirsch@i-kinetics.com.

Oracle Database Backup

Spectra Logic has announced OBACKUP Personality, designed to provide high-performance backup of Oracle databases and facilities integration with Oracle's Parallel Backup/Restore Utility. Spectra Logic's interface to Oracle's OBACKUP, a utility that includes a

system on four separate simulators or, alternatively, up to four separate screens on a single simulator.

Until now, only very high-end SGI computers offered the capability of splitting the output signal. Using an analog interface, RGB Spectrum's new system connects to virtually any computer, extending this capability to all SGI models, as well as workstations from HP and others.

The four-way splitter connects to the RGB monitor outputs of workstations and is compatible with all software. Its analog autosync front end ensures that the image generated by the computer is duplicated exactly on the simulator display.

Contact RGB Spectrum, 950 Marina Village Parkway, Alameda, California 94501, phone: (510) 814-7000, fax: (510) 814-7026.

Data Management

Cheyenne Software, Inc. has announced the ARCserve/Open 2.0 for HP-UX. Future versions of ARCserve/Open 2.0 for other platforms are scheduled to be released throughout 1994.

The software features Motif interface with pull-down menus and graphical icons, context-sensitive online help, and an installation script to automatically create configuration files. Simultaneous backup and restore to and from several devices concurrently is provided with parallel streaming, which is said to significantly increase the speed of backup and restore operations across the network. Byte-for-byte file checking ensures exact backups of original files and protection of permission passwords for sessions, clients, and files. Disk Grooming frees disk space by migrating dormant files from the server to tape. The product supports 4-mm, 8-mm, QIC, and DLT SCSI tapes and changers.

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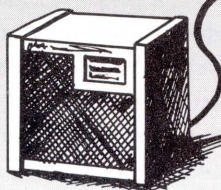
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KL Group's XRT/table

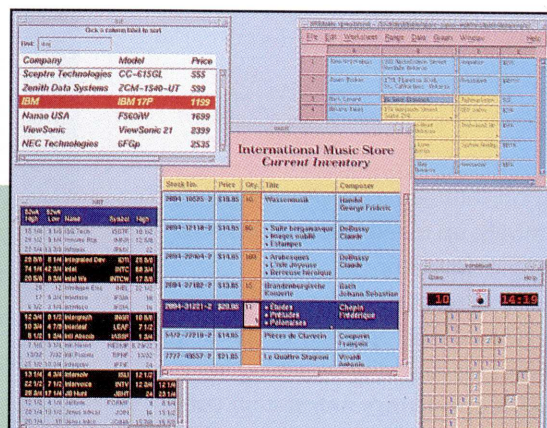
New from KL Group

Table Widget

KL Group has announced the release of XRT/table, a new multipurpose widget for enabling Motif developers to build graphical tabular text display and editing into their applications. Developers can create data-entry forms and editable scrolled lists, quickly and cost-effectively. The product can be used as a stand-alone tool or integrated with KL Group's market-leading XRT/3d and XRT/graph toolkit objects. Applications built with XRT tools are designed to provide end-users with a dramatically enhanced visual interface for the display and manipulation of information.

XRT/table is available on HP 9000 Series 700 and 800s, among other platforms.

All of KL Group's XRT products are based on the object-oriented architecture used by Xt Intrinsics and OSF/Motif. They extend the basic OSF/Motif object set while still allowing programmers to use the standard Motif API. XRT products feature PostScript output and complete integration with OSF/Motif.



Japanese 3-D Graph Widget

KL Group and Tangent Computing K.K., the exclusive distributor of XRT products in Japan, have announced a fully localized Japanese version of XRT/3d for OSF/Motif. The Japanese version includes Kanji font support and Japanese documentation and is available on HP 9000 Series 700 and 800s and other UNIX platforms.

A single-user development license sells for JPY475,000, about \$4,600 U.S., and includes one year of support. There are no run-time fees or royalties for distributing end-user applications built with XRT/3d.

Contact KL Group Inc., 260 King Street East, Third Floor, Toronto, Ontario, Canada M5A 1K3, phone: (416) 594-1026 or (800) 663-4723, fax: (416) 594-1919; e-mail: info@klg.com.

The U.S. retail suggested price for the base package supporting the server and up to 16 clients is \$1,995. The optional NetWare agent, which allows NetWare file server backup and restore, is priced at \$495. The Auto Changer option is offered for \$1,995.

Contact Cheyenne Software, Inc., 3 Expressway Plaza, Roslyn Heights, New York 11577, phone: (516) 484-5110, fax: (516) 484-3446.

Workgroup Project Management

Digital Tools has announced AutoPLAN II Version 2.0, project management software specifically designed for UNIX. New features include the AutoPLAN Programming Interface (APPI) and the Inter-Project Bulletin Board. The com-

pany also launched AutoTEAM, an add-on time and event activity manager designed to extend the workgroup features in AutoPLAN II v2.0.

The new version increases the product's automatic access to and integration of data from other projects and provides tracking information across multiple platforms and geographical distances with up-to-the-minute accuracy. AutoPLAN II allows people to manage projects in teams and workgroups.

The Inter-Project Bulletin Board creates an information network between all projects and people in the workgroup and automatically sends messages to each project as users adjust schedules, add new subprojects, or create inter-project depen-

dencies. The Calendar Pool centrally stores the calendars of individuals and projects; annotation capabilities allow users to write text notes that can be attached to, or pointed at, particular tasks in graphical reports. In addition, the new date formats are adaptable to international standards. The APPI enables users to integrate AutoPLAN II with other third-party applications and databases and their own specialized applications.

As an add-on to AutoPLAN II v2.0, the AutoTEAM time and event activity manager lets workgroup members automate the process of updating project schedules.

AutoPLAN II v2.0 is available on HP 9000 Series 700s and 800s and other platforms. Pricing for AutoPLAN II v2.0 starts at \$1,495, and AutoTEAM starts at

hp-ux/usr

Workstation Articles

Interex initiated the publication of *hp-ux/usr* to serve the needs of HP-UX users. It is a forum for sharing information on all HP-UX systems—including workstations, business systems, and networks. The award-winning magazine is now in its second year of publication, and it has met with an enthusiastic response from its readership.

Feature articles in *hp-ux/usr* so far have covered topics relevant to both Series 800 and Series 700 users. Some have been series-specific, some of general interest. The columns treat a wide variety of subjects, from systems administration to the X Window System. The Question and Answer department always contains both a general HP-UX and a workstation section.

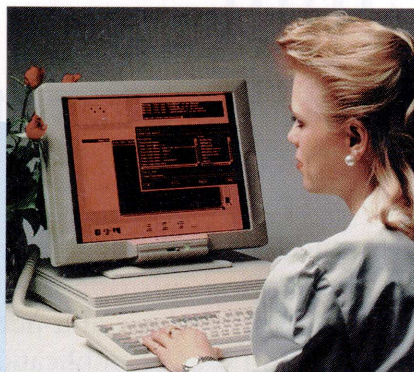
InterWorks and Interex now have an alliance in which cooperation and sharing are actively promoted. InterWorks has many experienced Series 700 workstation users and they are encouraged to write for *hp-ux/usr*. The magazine is a user-group publication and as such its underlying premise is the sharing of knowledge. InterWorks members who have the expertise, and a desire to help other users make more effective use of their workstations, are welcome in the pages of *hp-ux/usr*. It is an ideal forum in which to share that knowledge.

The magazine accepts articles on all aspects of HP-UX computing. It is *not* intended solely as a business UNIX publication: workstation articles on technical and scientific subjects are welcome. Authors are paid an honorarium of \$65 a typeset page. Writers who review software or hardware receive a bonus that ranges from \$300 to \$800, depending on the complexity and length of the review. *hp-ux/usr* is bimonthly; the due date for copy is nine weeks before the issue date. If you are interested in writing workstation articles, contact *hp-ux/usr* managing editor Michael Ehrhardt to discuss proposed topics and to request a copy of the Author's Guidelines. Send e-mail to ehrhhardt@interex.org or call 408.747.0227.

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Phase X Power X-Station



Flat Panel-X Terminal

Phase X Systems has announced POWER X-Stations, flat-panel display X terminals that are compatible with HP 9000s and other UNIX-based systems. The POWER X-Station family includes two models: 16FM, a 16-inch monochrome model, and 21FM, a 21-inch monochrome model. Both offer 1,280 x 1,024 resolution and use an LSI-33020 CPU, a MIPS-3000 compatible processor. The POWER X-Station performance measures in excess of 120,000 Xstones based the Xstones benchmark suite, Phase X notes.

The POWER X-Stations are equipped with X Server software that supports Sun OS, Sun Solaris, HP-UX, and other UNIX systems.

The flat-panel monitors used with the POWER X-Stations present a non-glare plasma orange on black background and are said to pose no measurable emissions or radiation. The monitor's footprint is one-tenth of a traditional desktop display. The flat monitor is less than 2 inches in thickness and can be wall-mounted.

The terminals ship with a minimum of 4 MB of RAM and an optional 4-MB Flash PROM memory. The POWER X-Station family has a built-in Ethernet adapter and TCP/IP. Remote networking over serial lines is possible using the Point-to-Point Protocol (PPP), Serial Line Internet Protocol (SLIP), and Compressed SLIP (CSLIP).

The POWER X-Terminals offer a three-year hardware warranty and a one-year software maintenance. The base prices for the 16FM and 21FM are \$4,500 and \$7,500, respectively.

Contact Phase X Systems, 19545 N.W. Von Neumann Drive, Beaverton, Oregon 97006, phone: (503) 531-2400, fax: (503) 531-2401.

\$495 per single user. Volume discounts as well as training and professional services are available.

Contact Digital Tools, 18900 Stevens Creek Blvd., Cupertino, California 95014, phone: (408) 366-6920, fax: (408) 446-2140; e-mail: info@digit.com.

Mail Handling

Group 1 Software has announced MailStream Plus/UNIX, Barcoding/UNIX, and Geographic Coding

digit or 11-digit barcode on mail pieces. Pre-barcoding enables mailers to earn substantial automation-based discounts and deliver mail with greater speed and accuracy. Barcoding/UNIX works with impact and laser printers and can be used with MailStream Plus/UNIX and CODE-1 Plus/UNIX to maximize postal discounts. Geographic Coding System/UNIX adds census geocodes and latitude and longitude information to name and address files based upon a USPS ZIP+4 code. Users can link these coded files with their own demographic database.

MailStream Plus/UNIX lists from \$6,500 to \$20,000, Barcoding/UNIX lists from \$2,000 to \$5,000, and Geographic Coding System/UNIX lists from \$7,500 to \$10,000, depending on the number of records passed through the system. Annual maintenance programs are available.

Contact Group 1 Software, 4200 Parliament Place, Suite 600, Lanham, Maryland 20706-1844, phone: (800) 368-5806, fax: (301) 731-0360.

DAT Subsystem

Transitional Technology, Inc. (TTi) has announced the CTS-4410 cartridge tape subsystem. The CTS-4410 is designed for high-speed stand-alone and networked PCs, file servers, workstations, minicomputers, and multiuser systems. The CTS-4410 has a native transfer rate of 366 KB/second and a compressed transfer rate of up to 766 KB/second.

TTi's LED display panel shows remaining tape capacity in megabytes and the amount of ECC usage—constantly monitoring tape quality and tape wear. These statistics, along with other tape movement status information, are shown in real time. No host intervention or communication is necessary to

System/UNIX for HP 9000s. These systems previously were available only for IBM and compatible mainframe and midrange computers and DEC VAX/VMS computers. MailStream Plus/UNIX automatically presorts first, second-, third-, and fourth-class mail according to USPS regulations to enable mailers to take advantage of postal discounts available.

Mail can be prepared for automated processing by the USPS by printing a 9-



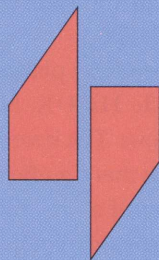
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support this LED display, the company notes.

The subsystem works with all popular DOS, NetWare, Windows, OS/2, and UNIX systems. It includes a configurable SCSI interface and a set of configurable switches that work with the subsystem's custom firmware.

The CTS-4410 comes with a two-year, return-to-factory warranty, and TTI's Service With Absolute Priority (S.W.A.P.) is free for the first 90 days. TTI's S.W.A.P. entitles the customer to a new unit within 24 hours should a problem occur. Additional S.W.A.P. contracts can be purchased from TTI.

Contact TTI, 5401 E. La Palma Avenue, Anaheim, California 92807, phone: (714) 693-1133, fax: (714) 693-0225.

Memory Error Detection

Advanced Software Automation, Inc. (ASA) has announced Hindsight/Membrain, which detects run-time memory errors such as memory leaks, freeing unallocated memory, accessing freed memory, and reading/writing beyond array bounds.

Hindsight/Membrain includes Hindsight/SLA (the Structure & Logic Analysis Module) and comes with an intuitive graphical user interface. Built-in editing capabilities provide for error correction directly from the Hindsight/Membrain environment.

ASA has integrated Hindsight with UIM/X 2.5, a comprehensive second-generation GUI builder. UIM/X enables software developers to create a GUI that links legacy systems together.

Membrain (stand-alone) costs \$500. Membrain with Hindsight/SLA costs \$1,450.

Contact Advanced Software Automation,

Product Data Management

Workgroup Technology Corporation has announced CMS/Pro Version 2.0, its product data management (PDM) tool for concurrent engineering and integrated product development in the Pro/ENGINEER environment. Enhancements include version control, release cycle management, and configuration management. CMS/Pro 2.0 is an add-on module to the company's SMA PDM and Workflow solution.

CMS/Pro 2.0 manages Pro/ENGINEER configurations on multiple platforms using industry-standard SQL databases such as Oracle and Sybase. Design teams can collaborate on projects and share designs, assemblies and subassemblies. CMS/Pro 2.0 can link Pro/ENGINEER files with other file types, including CAD, design analysis, CNC, manufacturing, and process control documentation. CMS/Pro 2.0 guarantees associativity and data integrity and ensures users that files are always organized, accessible, and available, the company notes.

The product is designed to provide paperless design-to-manufacture with the version control system, which allows components to be checked out for modification or approval or to be copied for read-only use. The product allows for simultaneous use of different revision levels of the same design. CMS/Pro 2.0 is designed to extract relationship information from Pro/ENGINEER configurations and to display build, and maintain the component relationships in CMS.

CMS/Pro 2.0 is compatible with Pro/ENGINEER version 12, and, like all CMS modules, runs on HP-UX, other UNIX platforms, and PCs. CMS/Pro 2.0 is sold on a floating licensing scheme and costs \$995 per seat.

Contact Workgroup Technology Corporation, 81 Hartwell Avenue, Lexington, Massachusetts 02173, phone: (617) 674-2000, fax: (617) 674-0034.

Inc., 3130A Coronado Drive, Santa Clara, California, 95054, phone: (408) 492-1668.

New from Candle Availability Management

Candle Corporation has announced the Candle Availability Command Center to address availability management for mainframe, distributed, and client-server systems. Associated applications will use Candle Technologies (CT), an advanced foundation that supports multi-platform openness and interoperability, provides open operating

system services through POSIX, provides a socket implementation that supports SNA and TCP/IP communications, and provides object capabilities.

The Candle Availability Command Center can be configured from both existing and future product-level building blocks.

The target platforms for the product include HP-UX, NetWare LANs, and Windows. The system and network applications that Candle targets include monitoring of alerts, faults, situations, and performance; automation; inventory and configuration; and software distribution.

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NetWare server print queues can be defined as remote printers on UNIX systems and accessed via standard **lp** command syntax. No software is required on the UNIX system.

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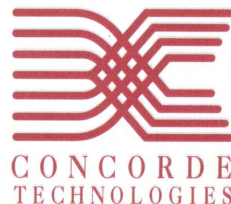
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Systems Management

Candle also announced OMEGAMON for HP-UX (Version 9.0). The product provides centralized monitoring of HP-UX from a central MVS mainframe computer. Graphical user information will be displayed on an OS/2-based workstation.

It provides detailed UNIX monitoring of user, system, wait, and idle CPU time; virtual and physical memory statistics; disk space and I/O statistics; paging information and swap statistics; processes waiting in the run queue; network information such as bytes sent and received; and multiple nodes and platforms from a single view.

Business graphics, advanced definition of alerts through a visual programming interface, integration of UNIX status with status from other systems, and business application views for UNIX and mixed environments are also available.

OMEGAMON will be part of the Candle Availability Command Center.

Contact Candle Corporation, 2425 Olympic Blvd., Santa Monica, California 90404, phone: (310) 829-5800.

Data Transfer

Bus-Tech Inc. has announced Datablaster, designed to be the fastest and least expensive method available to move large amounts of data between servers and mainframe computers. The Datablaster uses Bus-Tech's channel interface to provide high-speed file transfer (multi-megabytes per second) between mainframes and industry-standard server/workstation platforms.

Data transfer uses a SCSI-to-channel adapter. The Datablaster emulates a standard IBM tape control unit on the host side, while presenting SCSI tape signals to the target workstation. Data transfer

Document Management

Island Software has announced the Island Information Management Series, which allows users to search, retrieve, skim-read, and manage documents located throughout the communication-connected enterprise, as well as to create and publish documents using word processor companion products.

The first product in the suite is Island InTEXT for Windows, to be released in the second quarter of 1994. Island InTEXT is a collaborative product of Island Software and InTEXT Systems, a provider of online document management tools.

The product features Smart-Folders that automatically sort and categorize documents as they are created or received. Automatic indexing applies user-specified relevance ranking, and native file viewers provide "run-time" viewing capability without making use of the original word processing application. Document cabinets use hot links rather than duplicating documents.

Island InTEXT for Windows works with Word, WordPerfect, and Ami Pro for Windows on a PC. The product has a list price of \$395. The UNIX version of Island InTEXT, which will work with Island Write, Draw & Paint, and other word processors, will be available in the fourth quarter of 1994.

Contact Island Software Corporation, 4000 Civic Center Drive, San Rafael, California 94903-4178, phone: (415) 491-1000, fax: (415) 472-0335.

is bi-directional, supporting both uploads and downloads between connected systems. Modifications are not required on either the host side or the workstation platform, the company notes.

The Datablaster is available and priced starting at \$7,200.

Contact Bus-Tech Inc., 7600 Boone Avenue North, Minneapolis, Minnesota 55428-1099, phone: (612) 424-4888.

Remote cc:Mail Monitoring

Shany, Inc. has announced AlertVIEW for cc:Mail Routers. Combined with AlertVIEW, it is designed to detect and correct messaging problems experienced by cc:Mail users. The new cc:Mail-specific agent allows administrators to monitor Lotus cc:Mail Router activity from the AlertVIEW console for management of remote and local Lotus

cc:Mail Routers from a single location.

AlertVIEW for cc:Mail Routers detects and reports Lotus cc:Mail events in real-time to enable administrators to monitor all activities occurring on the Lotus cc:Mail Router. The event monitor reports the "what, when, and why" of occurring errors.

The product enables detecting and correcting application failures of the Lotus cc:Mail Router program; provides alerts for all messaging and communication failures in real-time; provides remote monitoring and correction of Lotus cc:Mail Router problems; and offers remote unattended recovery from Lotus cc:Mail correction procedures.

AlertVIEW for cc:Mail Routers offers SNMP and NMVT support and is integrated with HP OpenView, IBM NetView, Novell NDMS, and SubNet

Manager. AlertVIEW for cc:Mail Routers is priced at \$595.

Contact Shany Inc., 1101 San Antonio Road, Mountain View, California 94043, phone: (415) 694-7410, fax: (415) 694-4728.

Performance Activity Monitor

Bradmark Technologies, Inc. has announced the DBGENERAL performance activity monitor option for Oracle. DBGENERAL now runs on any server running Oracle as a Windows client.

The product is designed to offer real-time, mainframe-style database performance monitoring capabilities in the client-server environment. It provides the functions necessary for a database administrator to tune, monitor, and maintain a database management system.

This is DBGENERAL's second option for open systems applications; the Sybase version of the product was announced earlier this year.

DBGENERAL is available through resellers and directly from Bradmark sales. Prices range from \$1,000 to \$6,000, depending upon the configuration.

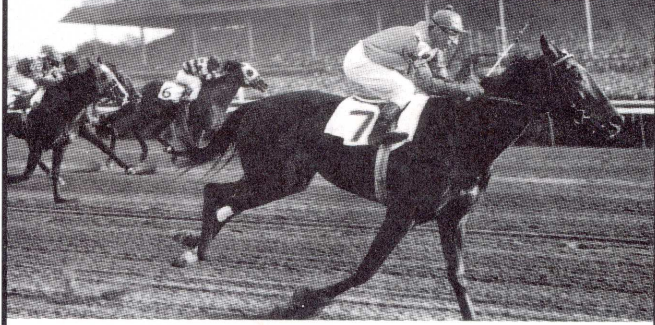
Contact Bradmark Technologies, Inc., 4265 San Felipe, Suite 800, Houston, Texas 77027, phone: (800) 275-2723, fax: (713) 621-1639; in Europe contact Bradmark UK at phone: (+44) 905-795444.

Screen Editor

Enabling Technologies Group has announced ce Release 2, which adds two new editing features to the X Window environment: multiple edit sessions on the same file and "pad support."

ce is a full-screen editor for UNIX systems that provides easy-to-use text editing across a variety of platforms. Features include rectangular cut and

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CIRCLE 49 ON READER SERVICE CARD

The McLean Group's HP 5000 Interface

paste, global bounded/forward and backward search and replace, coordinated mouse and cursor control, command macros, customized keyboard mapping, unlimited UNDO, and upper- and lowercase conversions.

One of the new features is "pad support." By invoking a special ceterm X Window, users extend ce editing functionality to the UNIX command line. Another new feature allows users to edit the same file in two or more separate ce sessions, which makes modification of large files much easier.

ce is available for HP-UX and other UNIX platforms.

Contact Enabling Technologies Group, Inc., 8601 Dunwoody Place, Suite 300, Atlanta, Georgia 30350-2509, phone: (404) 642-1500, fax: (404) 993-4667.

Database Development

Bluestone has announced db-UI/M/X2.5, the latest version of the company's front-end development tool. Version 2.5 includes additions to the NetWork Object Toolkit and Object Request Broker functionality, new local data caching, and complete widget support.

The product supports HP workstations and others with Sybase V4.9 and Sybase System 10. The company plans to support Oracle and Informix databases in future versions.

With Version 2.5, Bluestone has added new functionality to db-UI/M/X's Network Object Toolkit and OMG CORBA-compliant Object Request Broker (ORB). These new features target large production-level application deployment.

Version 2.5 also offers two new features: local data caching of database results and widget support. Caching improves application performance by

storing frequently used data in a local, readily accessible state. Complete support of Motif widgets, as well as Matrix and XRT/graph widgets, gives db-UI/M/X complete GUI capability.

db-UI/M/X2.5 is priced at \$6,500. Bluestone will upgrade UI/M/X with db-UI/M/X2.5 at a quantity-one price of \$2,250.

Contact Bluestone Consulting Inc., 1200 Church Street, Mount Laurel, New Jersey 08054, phone: (609) 727-4600, fax: (609) 778-8125.



HP 5000 Interfaces

The McLean Group has announced two printer interface and protocol converter products for the HP 5000 Series C30 and C30D page printers when operating with HP 3000s and HP 9000s. The new products are adapted from the existing TMG L-Series printer interface and server product line. The first is the L-15X, which is a multiple, dynamic, stacked Ethernet printer server that supports multiple protocols including TCP/IP, Novell NetWare, and Apple Ethertalk. The L-15X is delivered with both 10BaseT and 10Base2 Ethernet connectors and is user-configurable. The L-15X supplies a parallel cable to the HP 5000 C30/C30D.

The L-25X provides HP-IB protocol conversion. The L-25X is a plug-to-plug connection and emulates the HP 256x line matrix printer. The user need only connect an IEEE cable to the L-25X, select his or her address, and connect the supplied parallel cable to the HP 5000 C30/C30D printer. All other HP 256x printer configuration requirements are programmed into the L-25X. The L-25X will support all PCL5 commands and operate transparently with HP 3000 and HP 9000 Native Spooler, the company notes.

The L Series is designed for operator installation with self-test and diagnostic utilities available. All L Series products carry a 90-day return-to-factory warranty. Price for the L-15X is \$995; for the L-25X it is \$1,995.

Contact The McLean Group, Inc., 1700 South El Camino Real, San Mateo, California 94402, phone: (415) 638-1100, fax: (415) 638-1104.

Distribution Agreement

Advanced Archival Products, Inc. (AAP) has signed a software distribution agreement with HP. Under the agreement, HP will market AAP's AMASS file system software combined with HP's optical disk libraries. HP will provide complete technical support for the combined hardware/software solution. The offering is available to HP systems customers and through HP distributors to VARs and system integrators.

Under this HP distribution agreement,

Interex '93 Conference Proceedings

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Proceeding rates are as follows:

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additional copies	
General-level members	\$60
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the entire HP optical library product line from 20 GB to 187 GB, with 1.3 GB drives, will be supported on HP 9000 Series 700 workstations running HP-UX 9.01.

Contact Advanced Archival Products, Inc., 6595 S. Dayton Street, Suite 1200, Greenwood Village, Colorado 80111, phone: (303) 792-9700, fax: (303) 792-2465.

Reorg Tool

Oracle Corporation and Dimeric Development Corporation have announced TSreorg, a sophisticated tablespace defragmentation/reorg tool for small to very large ORACLE7 databases residing on a single CPU or multiple CPUs in a distributed environment. The product allows manual and automatic scheduling of tablespace reorgs and selective reorgs of individual tables and indices. It is also designed to enable ORACLE7 DBAs to partition tables onto multiple-disk devices for maximum I/O performance. Other features include shrinking of table columns, changing data types, cut and paste of tables from one tablespace to another on the same or a different database, and a true client-server architecture using a smart agent and graphical management console.

TSreorg Version 1.0 was scheduled for general availability in July 1994 for HP-UX and other platforms.

Contact Dimeric Development Corporation, 22020 Clarendon Street, Suite 204, Woodland Hills, California 91367, phone: (818) 710-1112, fax: (818) 710-1058.

SCSI-2 Disk Emulators

Disk Emulation Systems, Inc. (DES) has announced the FW-Series of solid-state disk emulators (SSDE) with fast/wide SCSI-2 interfaces. The FW-Series can process over 2,000 percent more input/output requests (11,600) per second than magnetic rotating disk drives and improve overall system performance by up to 1,000 percent, the company notes.

The FW-Series solid-state disk emulators require no drivers or patches, so they appear to the host computer exactly like a disk. In addition, because there are no moving or rotating parts, seek and latency times are zero.

The FW-Series solid-state disk emulators connect to all major industry platforms, operating systems, and relational databases. For a 670-MB unit, list price is \$75,662 and includes the FW-Series controller board, chassis subsystem (power supply, battery, and disk) and five 134-MB memory boards. The FW-Series controller board by itself is \$7,266.

The solid-state disk emulators are engineered with a complete integrated back-up system that includes a 2.5-hour battery and an internal disk to ensure 100-percent nonvolatility. The solid-state disk emulators are configurable from 34 MB to 2.1 GB of dynamic random access memory (DRAM). DES products support most host systems including HP.

Contact DES, 3080 Oakmead Village Drive, Santa Clara, California 95051, phone: (408) 727-5497, fax: (408) 727-5496.

Electronic Forms

JetForm Corporation has announced JetForm Server for HP 9000s and other UNIX systems. JetForm Server is designed to enable application developers and value-added resellers (VARs) to "forms enable" their existing desktop applications via a UNIX server. With JetForm Server software, a UNIX server can now create professional-looking forms at the server level and output them right to networked laser printers.

JetForm Server's built-in Merge feature is designed to map data from the client application to the appropriate field on electronic forms created in JetForm Design, eliminating both the development

time previously needed to position data in an overlay environment and the need for preprinted paper forms.

Multitasking capabilities enable one screen in a client application to trigger the creation and output of multiple forms on different network printers across a UNIX network.

Pricing for the new UNIX version of JetForm Server ranges from \$3,000 to \$9,000, depending on the hardware configuration.

Contact JetForm Corporation, Watermill Center, 800 South Street, Suite 305, Waltham, Massachusetts 02154, phone: (617) 647-7700, fax: (617) 647-4121.

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For more information, contact Liway Gimenez, Interex, P.O. Box 3439, Sunnyvale, California
94088-3439 USA, Phone (408) 747-0227, FAX (408) 747-0947.

Office Automation

OPN Systems, Inc. has announced OPN:Office v7.3, which includes a new GUI that supports X terminals and PCs running an X terminal emulation package. These terminals give users the advantage of a GUI, yet allow system administrators to control the data that remains on the UNIX host.

OPN:Office is designed to connect hundreds and thousands of users within large organizations operating on UNIX. OPN:Office includes electronic mail; advanced document management; connection of diverse terminals, workstations, and PCs to servers; automatic personal and group calendaring and scheduling; gateways to communicate worldwide with other e-mail systems; and easy, professional desktop publishing.

Several new document recipient list displays have been added, including the ability to see if the recipient passed the document to a user not on the original sender's list. In addition, document originators can specifically view only those recipients who have read their documents and/or those who have taken action.

OPN:Office v.7.3 now includes two previous add-on products: PC Companion and OPN:Style. PC Companion allows users to directly access OPN:Office on their assigned server from their own PC, as well as transfer documents developed on their PC to other users through OPN:Office. OPN:Style is said to require little or no training and offers all OPN:Office users the ability to automatically produce professional-looking documents, newsletters, reports, and memos in minutes.

Contact OPN Systems Incorporated, P.O. Box 13729, Fort Wayne, Indiana 46865-3729, phone: (800) OPN-1177, fax: (219) 455-4002.

Contact JetForm Corporation, Watermill Center, 800 South Street, Suite 305, Waltham, Massachusetts 02154, phone: (617) 647-7700, fax: (617) 647-4121.

Remote Internet Access

UniPress Software, Inc. and Comm-Touch Software have announced Pronto Mail, an MS Windows e-mail program that supports easy communication between PC and UNIX networks.

Pronto Mail enables PC users to remotely access their host UNIX networks and the Internet. They can upload or download mail and read or respond

to messages off-line without leaving Windows. The GUI organizes e-mail notes in Windows folders, each of which has a header listing identifying information about the notes it contains. Mail can be downloaded to the PC and kept on the UNIX machine for later reading, or it can be downloaded to the PC and removed from the UNIX side.

Pronto Mail's mail operations include view, forward, reply, reply all, print, move, and copy to folder. Editing features include word wrapping, spell checking, a system for holding work in progress, and a wastebasket for "safe" deleting. The program has an Import/Export

facility for both files and folders, a search capability according to date, sender, subject and contents, and a mail feature for sorting by date, sender, or subject.

Pronto Mail also features vt100 terminal emulation, ZMODEM file transfer, and a powerful scripting language for user customization. In addition, aliases stored on the host can be automatically downloaded to the PC.

A Pronto Mail one-user pack is priced at \$149. Five-packs are priced at \$119/user; 10-packs at \$99.50/user; 50-packs at \$79.50/user, and 100-packs at \$75/user. Pronto Mail is available for PCs running MS Windows 3.1 and UNIX hosts.

Contact UniPress Software, Inc., 2025 Lincoln Highway, Edison, New Jersey 08817, phone: (908) 287-2100, fax: (908) 287-4929.

RAID Storage Subsystems

Dataram Corporation has announced the DTM900 Series of fault-tolerant RAID storage subsystems for the HP operating environment and others.

The DTM900 is a hardware-based RAID 1 (disk mirroring) subsystem with capacity options from 1 GB to 12 GB. The DTM900 combines RAID 1 mirroring with dual controllers, I/O, fans, and load sharing power supplies to provide a near-100-percent fault-tolerant design and advanced monitoring capability.

The DTM900 Series is the second product in the DATARAID line. The first offering, the DTM1000, is a mid-range system that offers user-selectable RAID 0, 3, and 5 functionality and up to 28 GB of storage capacity. Dataram now offers RAID levels 0, 1, 3, and 5 with user-selectable capacity and advanced monitoring in an easy-to-use modular enclosure.

front-panel display.

All DATARAID systems are backed by a five-year warranty, with optional worldwide on-site installation and service programs available.

Dataram Corporation, P.O. Box 7528, Princeton, New Jersey 08543-7528, phone: (609) 799-0071, fax: (609) 799-6734.

Resume Processing

PeopleSoft, Inc. has announced PeopleSoft Resume Reader, a component of PeopleSoft HRMS human resources management software.

Developed by RESTRAC, Inc. (formerly MicroTrac Systems, Inc.), Resume Reader works as a front-end resume processing system to PeopleSoft HRMS and integrates seamlessly into the Human Resources Applicant Tracking System through an interface developed by PeopleSoft. Using high-volume scanning, OCR imaging, and search/find functions, PeopleSoft Resume Reader enables corporate recruiting personnel to scan incoming resumes for automatic processing, storage, and retrieval at a rate up to 10 times faster than manual or partially automated systems, PeopleSoft notes.

With a partnership agreement signed last May, RESTRAC became the exclusive supplier of high-performance resume-scanning systems for PeopleSoft.

PeopleSoft Resume Reader is available for shipment with PeopleSoft HRMS 3.22 on Gupta's SQLBase relational database management system. It will be available for all other database platforms supported by PeopleSoft HRMS during the third quarter of 1994.

Contact PeopleSoft, Inc., 1331 North California Blvd., Walnut Creek, California 94596, phone: (510) 946-9460, fax: (510) 946-9461.

Memory Expansion

Cal-Logic has announced the CL-350 memory expansion board for all HP 9000 Model 330, 350, and 370 computer systems. Each CL-350 memory board can be configured to hold either 0, 4, or 12 MB of memory. According to the company, the CL-350 memory board is the first HP 9000 Model 330/350/370 memory product that enables the user to upgrade these models using common low-cost memory components. Memory expansion is accomplished by the installation of additional standard 1-Mbit DRAMs.

Each CL-350 memory board is tested for a 72-hour period prior to shipment, and each CL-350 board is covered by a lifetime warranty. A 30-day free trial program is available, and single-unit pricing is as follows: configured with 0 MB, \$250; configured with 4 MB, \$550; configured with 12 MB, \$1,150.

Contact Cal-Logic, 18707 Parthenia Street, Suite 3, Northridge, California 91324, phone: (818) 701-9005, fax: (818) 701-5572.

Lint Tool

Gimpel Software has announced FlexeLint 6.0 for C/C++, reportedly the first lint tool to support C++. The tool will analyze a mixed suite of C and C++ programs and report on bugs, glitches, and inconsistencies. It provides a number of specific checks that C++ authors, authorities, and devotees have advanced and advocated in recent years. These include reminders to virtualize inherited destructors and to create custom assignment operators and copy constructors for classes that evidence a need for them. Other checks include new and delete imbalances, name hiding, unusual but legal constructs, etc.

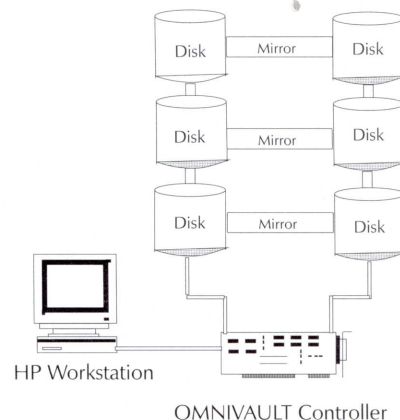
In addition, FlexeLint for C/C++

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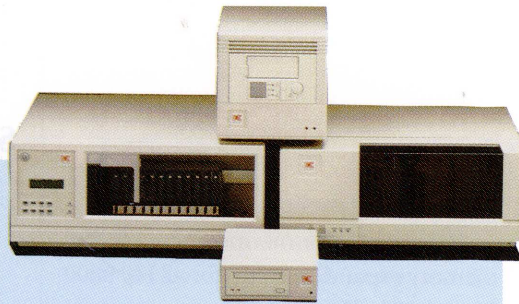


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Concorde DAT**DDS-2 Tape Drives**

Concorde Technologies, Inc. has introduced 4-mm DAT tape drives and tape autochangers. DDS-2 provides twice the storage capacity of previously available DAT drives. The drives support 4 GB of native-mode storage and over 8 GB (typical) of compressed storage per tape cartridge. Autochanger models provide automated unattended storage and retrieval of up to 600 GB of data. Each model is equipped to support all major UNIX computer platforms, including the HP 9000. Existing 60-meter and 90-meter DAT tapes are supported by the new 120-meter tape systems (under DDS-1 mode).

The single-drive Model HPT4000DC is available in a tabletop enclosure or an internally mountable configuration. It offers a transfer rate of over 1.0 MB/second. The tabletop unit is available with or without an LCD status display. Mounting kits are available. The Model HPT4000DC prices start at \$2,495 and include a one-year warranty.

The entry-level DAT autochanger system, the Model HPT4800DC, uses six DDS-2 tape cartridges for a typical capacity of 48 GB/second. It uses the 5.25-inch, industry-standard, full-height form factor. It also features an integrated front-panel display and is available in a tabletop enclosure and an internally mountable configuration. The HPT4800S starts at \$4,995.

Concorde's Model ADT4MMDC is a DAT autochanger system with the capacity for 15 DDS-2 tape cartridges and may contain either one or two DAT drives. The standard 120-GB Model ADT4MMDC comes in a tabletop cabinet and includes a front-panel status display at a list price of \$7,995.

The top-of-the-line Model SLT4000DC is a DAT autochanger with the capacity of one, two, three, or four tape drives and up to 60 DDS-2 tape cartridges. It offers capacity of over 480 GB of data and a synchronous data transfer rate of over 4 MB/second. It includes a front panel display and offers optional barcode reader capability. List prices start at \$9,175 for a 20-cartridge, single-drive unit without the barcode option and \$15,975 for the same configuration in a 40-cartridge library. A 60-cartridge, two-drive unit with barcode (typical for high-capacity needs) is \$25,275, or \$29,900 with 58 cartridges and four tape drives installed.

Contact Concorde Technologies, Inc., 6370 Lusk Blvd., Suite F100, San Diego, California 92121, phone: (619) 458-0702.

cessed variables, unusual macros, unused program components, and more. It looks across multiple modules.

FlexeLint for C/C++ is based on the ARM (Annotated C++ Reference Manual, Ellis & Stroustrup) and is tracking the ANSI/ISO X3J16 standardization process, including templates and exceptions. It will handle very large applications and will use all available memory. The product has no built-in tables to overflow and has no built-in limit to the number of functions allowed.

FlexeLint can be used on mainframes, minicomputers, and workstations, including all flavors of UNIX. The software is distributed on MS-DOS formatted diskettes. FlexeLint carries a 30-day money-back guarantee.

Contact Gimpel Software, 3207 Hogarth Lane, Collegeville, Pennsylvania 19426, phone: (215) 584-4261, fax: (215) 584-4266.

Development Tool

Apertus Technologies Inc. has announced Enterprise/Access 2.0. The new product, targeted to Fortune 500 organizations with heterogeneous mainframe environments, lets IS organizations build client-server interfaces to legacy mainframe systems for mission-critical, large-scale OLTP applications.

The Open Server Gateway provides a common interface to Sybase's SQL Server and Microsoft's Open Database Communication (ODBC). With the Open Server Gateway, client applications can invoke interfaces to legacy applications in exactly the same manner as they communicate to a Sybase database, using stored procedures. The Open Server Gateway also allows tools such as Powersoft's Powerbuilder and Microsoft's Visual Basic to communicate seamlessly

destructors and to create custom assignment operators and copy constructors for classes that evidence a need for them. Other checks include new and delete imbalances, name hiding, unusual but legal constructs, etc.

In addition, FlexeLint for C/C++ provides the rigorous checking of FlexeLint for C. These checks include strong type checking, a control-flow-based analysis of variable initialization, loss of precision, strange uses of Booleans, unac-

from \$22,000 to \$240,000, based on the machine class of the UNIX server.

Contact Apertus Technologies Inc., 7275 Flying Cloud Drive, Eden Prairie, Minnesota 55344, phone: (212) 279-8400.

Structured Analysis and Design

Interactive Development Environments has announced Software through Pictures/Structured Environment (StP/SE) Version 5.0, which features an advanced, fully re-architected, and rebuilt core technology. Users can warehouse development information in one central repository.

StP/SE is a set of tools for graphically developing requirements specifications and designs for software applications. It features data flow diagrams, data structure diagrams, real-time analysis, and behavioral modeling. StP/SE "understands" the design diagrams and notations of structured methodologies such as Yourdon/DeMarco, Gane/Sarson structured systems analysis, Hatley/Pirbhai real-time extensions, Jackson hierarchical data structures, Yourdon/Constantine structured design, and Watts/Humphrey's software process model.

New features include a shared repository that stores all analysis and design information in one central location, a consistent and intuitive user interface, a new "collapse and explode" feature for moving portions of dataflow diagrams, and options to split and merge data flows. In addition, users can choose integration frameworks such as HP Soft-Bench, version control support for SCCS, and document generation tools like FrameMaker or Interleaf.

StP/SE was scheduled to be available for HP 9000s in the second quarter of 1994. Under IDE's X Windows

implementation, any workstation or X-server that supports the X11 protocol can act as a display device. Pricing for StP/SE starts at \$10,000.

Contact Interactive Development Environments, 595 Market Street, 10th Floor, San Francisco, California 94105, phone: (415) 543-0900, fax: (415) 543-0145.

Mass Storage for TCP/IP

Young Minds, Inc. (YMi) has developed a mass storage system for TCP/IP network environments. The system, known as UltraCapacity, includes CD Studio, SecureCD Studio, and SimplicD.

The UltraCapacity system allows transparent network access to CD-ROM jukeboxes, towers, and disc changers, as well as to the CD Studio recording system. Each network client sees the entire library of CD-ROM discs as a single or multiple online file system. UltraCapacity is designed to transparently load and unload discs to satisfy I/O requests.

The UltraCapacity software provides the flexibility to use a high-performance YMi CD-ROM controller or adapt an existing Windows NT or UNIX host (HP and others) into a complete UltraCapacity server. The software fully supports all UNIX and Windows NT TCP/IP networks and all MS-DOS, MS Windows, and Macintosh clients through TCP/IP and NFS; no client software is needed.

Network solutions include CD-ROM drive arrays; six- and 18-disc changers; 100-disc jukeboxes with one drive; 200-disc jukeboxes with up to 14-drives; and the CD Studio recording systems. Additional jukeboxes will be announced as they become available.

Contact Young Minds, Inc., P.O. Box 8130, 1910 Orange Tree Lane, Redlands, California 92375, phone: (800) YMI-4YMI

Pro_EDI

Intelligent EDI

Pro_EDI is an advanced, flexible EDI utility which runs on many different computers. Pro_EDI gives you the power to integrate EDI seamlessly with any application software.

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Pro_EDI supports all ANSI X.12 standards and derivatives (such as TDCC, VICS, AIAG, etc.), and UN/EDIFACT.

Pro_EDI runs on HP 3000 and HP 9000 computers, PCs, and UNIX (HP-UX, SCO, ATT).

Single-tier pricing

Pro_EDI has one price tier for each hardware platform on which it runs. There are no added charges for CPU upgrades, new trading partners or EDI documents.



Pro Software, Inc.
Suite 240
725 Barclay Circle
Rochester Hills, MI 48307

(810) 299-0020 (Voice)
(810) 853-2442 (FAX)

Pro_EDI is a trademark of Pro Software, Inc. UNIX is a trademark of UNIX System Laboratories in the USA and other countries.

CIRCLE 126 ON READER SERVICE CARD

Faximum Client-Server**Fax Communications**

Faximum Software Inc. has announced Faximum Client-Server, designed to enable the sending and receiving of faxes from terminals, workstations, and applications.

Faximum includes a Motif user interface with online help; X and TCP/IP support; ability to send faxes from within WordPerfect and other word processors; intelligent dialing and least-cost routing to cut phone bills; and support for a wide range of nonproprietary fax modems. According to the company, Faximum can cut staff costs by 90 percent and telephone charges by 60 percent over traditional office fax machines.

Client-Server is a fully distributed client-server fax package developed from a joint development and technology exchange with Hewlett-Packard. A single UNIX workstation can operate as a fax server providing fax services to hundreds of networked UNIX machines. The workstation need not be dedicated to fax, and only the fax server need be connected to a fax modem. Faximum clients and servers will interoperate with HP MPower clients and servers.

The product was in beta testing as of press time, with release expected shortly thereafter. The price for a single-line system and two floating user licenses is \$1,695 (software only). Additional floating user licenses are \$295 each or \$1,095 for five.

Contact Faximum Software Inc., 1497 Marine Drive, Suite 300, West Vancouver, BC, Canada V7T 1B8, phone: (604) 925-3600, fax: (604) 926-8182.



and Prevail/XP offering. The first deliverables are expected to be available in July 1994. Both companies will continue to market their respective products.

Contact Legent Corporation, 575 Herndon Parkway, Herndon, Virginia 22070-5226, phone: (703) 708-3118.

Networked Video

Human Designed Systems (HDS) has announced a full-motion video option for its RISC-based X Window terminals. HDS Video allows users of HDS X terminals to display full-motion video in up to four windows on HDS X terminal screens. HDS Video is based on industry standards and supports both analog and digital video with onboard compression and decompression. All HDS X terminals are designed around a common RISC architecture and use the same operating software version.

A camera, video CD-ROM, or VCR can be connected to the terminal. The video windows can be displayed and moved or resized up to full screen. The terminal supports full-screen display of broadcast-quality video at a full 30 frames per second.

Intel/Microsoft Indeo compression is standard, and MPEG 2 hardware decompression is optional. With the Indeo standard, users can send digital video over the network or store it in a file.

Every HDS X terminal also can be configured with HDS Audio for recording and playback of stereo sound.

The video and audio features are priced, per user, as follows: HDS Stereo Sound, \$199; Digital Video, \$199; Analog

or (909) 335-1350, fax: (909) 798-0488.

Open Systems Management

Legent Corporation and HP have announced a joint agreement to develop, market, and sell integrated versions of HP's OpenView OperationsCenter and Legent's Prevail/XP and PARADIGM products.

Legent will become an OEM to HP's OpenView OperationsCenter problem and operations management solution and integrate it into Legent's Prevail/XP operations management products. The resulting product, to be sold by Legent, is intended to provide comprehensive,

integrated automation capabilities across a wide range of hardware platforms from one OpenView console, including HP-UX.

In addition, HP will be an OEM for Legent's PARADIGM problem management software and will integrate it into HP OpenView OperationsCenter to enhance its problem management capabilities for multivendor networks and systems.

Under the agreement, HP will market and distribute PARADIGM technology and support the product as part of HP OpenView OperationsCenter. As part of the Prevail automation suite, Legent will market, distribute, and support the combined OperationsCenter

and Digital Video, \$499; and the HDS Conference application, \$199.

Contact Human Designed Systems, 421 Feheley Drive, King of Prussia, Pennsylvania 19406, phone: (610) 277-8300, fax: (610) 275-5739, e-mail: info@hds.com.

Database Management

ADB, Inc. (formerly Object Databases) has announced the release of M.A.T.I.S.S.E. Version 2.3, a database management system that combines advanced object-oriented modeling capabilities with mission-critical transactional technology. Major enhancements of Version 2.3 are embedded SQL with OQL extensions, additional API functionality, and performance upgrades. M.A.T.I.S.S.E. Version 2.3 supports HP-UX and other server platforms. Version 2.3 Microsoft Windows and Macintosh clients were to be released in Summer 1994.

This multiuser system is used in application areas such as health, defense, transportation, utilities, and telecommunications. Current applications consist of configuration and technical data management systems, decision support applications, advanced document management systems, signal and process data organization, and medical, pharmaceutical, and biological data applications.

Contact ADB, Inc., 238 Broadway, Cambridge, Massachusetts 02139, phone: (617) 354-4220, fax: (617) 547-5420, e-mail: info@adb.com.

New from Combinet

On-Demand Access Server

Combinet, Inc. has introduced the EVERYWARE 900 On-Demand Access Server for managing remote access to an enterprise network for hundreds of

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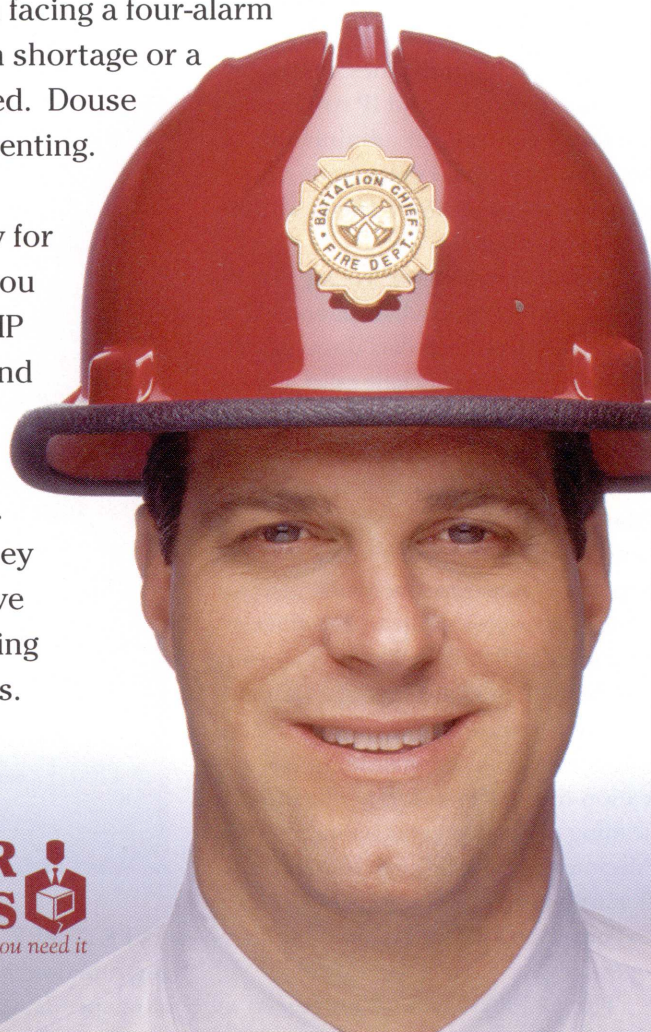
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users. The EVERYWARE 900 provides high-speed call-in access to an enterprise LAN from remote sites via ISDN-PRI (Integrated Services Digital Network Primary Rate Interface) telephone lines. It supports advanced bridging and IP routing and includes centralized administration, security, 4-to-1 data compression, SNMP remote management, and multilink protocol support.

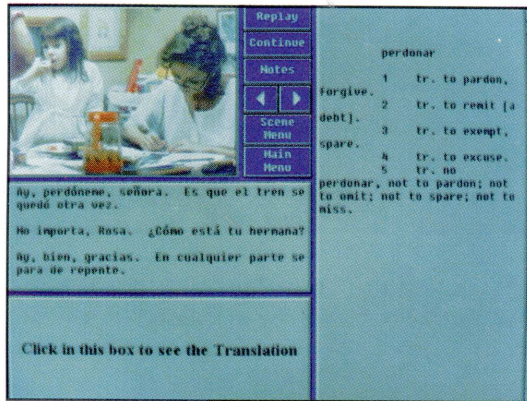
Remote software downloading permits centralized software administration. The access server protects data through security capabilities that include caller authentication for up to 5,000 addresses and automatic call-back for up to 1,000 remote sites. It works with Combinet's Connection Manager to provide reporting and accounting. The EVERYWARE 900 can support 23 actual connections at any one time and supports up to 1,000 users. Multiple EVERYWARE 900 Access Servers can be combined in a modular fashion.

The access server supports all leading network operating systems, is application-transparent, and works with all leading desktop systems including PCs, Macintosh computers, workstations, and X terminals. It also supports PPP (Point-to-Point Protocol) for multivendor interoperability.

The EVERYWARE 900 is priced at \$4,990 and was to be available in June 1994.

On-Demand Bridge

Combinet also has announced the EVERYWARE SOHO (Small Office/Home Office) On-Demand Bridge to provide high-speed remote access for users at home or at remote offices with more than one desktop system. The



HRB Systems ESL 2000

Multimedia ESL

HRB Systems has announced a language learning program that integrates interactive multimedia and award-winning movies for instruction in English as a second language (ESL).

The program, ESL 2000, teaches language to students through movies running on computers equipped with laser disc and CD-ROM. The students interact with the film by listening to the dialogue, choosing to see a written script, or looking up a word in the online dictionary. ESL 2000, through independent study, allows the student to choose his or her pace, depth, speed, and length of instruction.

The interactive segment of the program is menu-driven and employs a mouse and pointing device. ESL 2000 incorporates HRB's Language Dynamics technology and includes videos, multimedia games and drills, student workbooks, and integrated one-on-one and small group sessions.

HRB Systems entered into a cooperative research and development agreement with the U.S. Air Force Academy to ensure that ESL 2000 and all future language learning systems are sound.

HRB Systems will offer ESL 2000 to the market through international and domestic joint ventures and distribution agreements. The company also will license its ESL 2000 systems to educational and other nonprofit organizations worldwide. ESL 2000 curriculum is \$8,500 per workstation for the first year and \$3,500 each year thereafter. The movie can be bought independently for \$400.

Contact HRB Systems, 800 International Drive, Linthicum, Maryland 21090-2211, phone: (410) 850-7890.

EVERYWARE SOHO provides bridging functionality via ISDN at transmission speeds up to 128 KB per second (higher with compression) and can support up to four computer devices concurrently.

The EVERYWARE SOHO is easy to use and can be installed within minutes by nontechnical users. The SOHO also can be configured, managed, and upgraded remotely from a central site or branch location. It is compatible with

any Ethernet-based LAN and operates with PCs, Macintosh computers, workstations, and X terminals. It supports all leading network operating systems and higher-level protocols such as TCP/IP and XNS.

The EVERYWARE SOHO is priced at \$1,190.

Contact Combinet, Inc., 333 W. El Camino Real, Sunnyvale, California 94087, phone: (408) 522-9020 or (800) 967-6651, fax: (408) 732-5479.

Bundled Libraries

Lucid, Inc. has announced an agreement with Rogue Wave Software, Inc. to bundle its Tools.h++ class library with Lucid's C++ compiler and Energize Programming System, Lucid's integrated development environment for C and C++. Lucid also will distribute Rogue Wave libraries targeted at specific vertical applications.

The Tools.h++ library is a general-purpose set of over 100 C++ classes. The kit includes a host of data structure classes and a complete set of collection classes modeled after the Smalltalk-80 environment.

Lucid will distribute the object code version of the library to customers for no additional charge. The source code version will be available for an additional fee. Lucid will make versions of other Rogue Wave libraries available to customers, including Money.h++, for handling decimals with arbitrary precision, and View.h++, a C++ interface to Motif.

Energize is currently priced at \$4,250 for a single unit and \$2,950 per unit for 10. Site licenses and educational discounts are available. Lucid C++ lists for \$1,095. Lucid offers customer support for all products.

Contact Lucid, Inc., 707 Laurel Street, Menlo Park, California 94025, phone: (415) 329-8400, fax: (415) 329-8480.

Distributed Processing Engine

Aggregate Computing, Inc. has announced NetShare SDK (software development kit). NetShare SDK allows application developers to incorporate distributed processing capabilities into their own software applications. NetShare-enabled applications are intended to use an entire network of machines in parallel for task execution.

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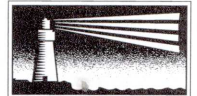


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HP 700/70 Windowing Terminal**New from HP****Low-Cost Windowing Terminal**

HP and Structured Software Solutions, Inc. (SSSI) have announced the HP 700/70 Windowing Terminal, a low-cost UNIX-based terminal that offers windowing for running multiple application sessions simultaneously. Bundled with SSSI's Facet-Term windowing software, the HP 700/70 provides the "look and feel" of more expensive windowing systems—including X Window and Motif-based systems—at the price of a traditional text terminal.

Fully compatible with both ANSI text terminals and the "alpha window" terminal standard, the HP 700/70 is intended for transaction processing, customer claims processing, and applications in which text terminals are commonly used. The HP 700/70 also is available as an upgrade from HP 700/60 text terminals.

The HP 700/70 Windowing Terminal comes with a license for SSSI's FacetTerm window-management software, a 14-inch monochrome display, keyboard, user's manual, and power cord; a mouse is optional. Users can order the HP 700/70 with a PC-AT or ANSI keyboard and their choice of a white, green, or amber display.

The terminal's built-in windowing features are similar to those of X terminal systems and include pull-down menus, scroll bars, icons, easy copy and paste between windows, and window maximizing/minimizing.

FacetTerm allows users to run up to six software applications or connections to networked UNIX-system-based hosts simultaneously, as opposed to one session for a traditional text terminal. Users can move easily among active applications or host sessions by pointing and clicking with a mouse or using a hot key.

The HP 700/70 Windowing Terminal operates with all common UNIX-system-based implementations, including HP-UX 9.x. It is available in base configuration for \$499, which includes a keyboard and license to use SSSI's FacetTerm windowing-management software. An MPR-II-compliant version is available for \$549. The optional mouse is \$30, and the Model 700/60 to 700/70 upgrade kit is \$69. A media kit to install SSSI's FacetTerm software on a UNIX-system-based host is \$99 in the user's choice of HP DAT, DEC cartridge tape, or 3.5-inch floppy format for IBM, SCO, and Intel platforms. One media kit is required per site.

Contact HP at phone: (800) 637-7740.



Compute-intensive applications can be built to access the distributed processing engine, which is designed to mask all network and operating system complexities. With NetShare SDK as the foundation, application developers do not need network programming expertise to build reliable, "network-smart" distributed applications, the company notes.

NetShare-enabled applications are designed to find and use the best available processing power across the network to run tasks in parallel. The product actively monitors the resources available on the network and matches them to application needs.

It is designed to operate with multi-vendor hardware and operating systems and is currently available on HP and other platforms.

Contact Aggregate Computing, Inc., 300 South Highway 169, Suite 400, Minneapolis, Minnesota 55426, phone: (612) 546-5579, fax: (612) 546-9485. ■

Attention vendors: New product announcements should be sent to New Products Editor, hp-ux/usr Magazine, Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA.

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